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EBRUARY 15, 1943
OLUME 32, No. 4

AMERICAN DYESTUFF REPORTER

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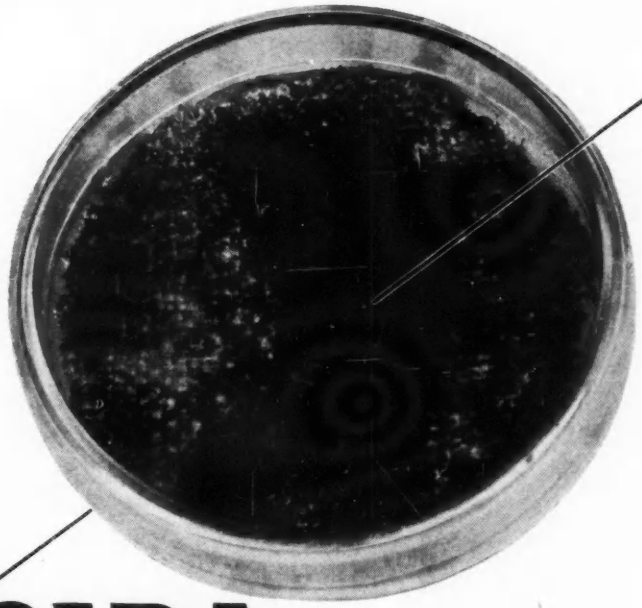

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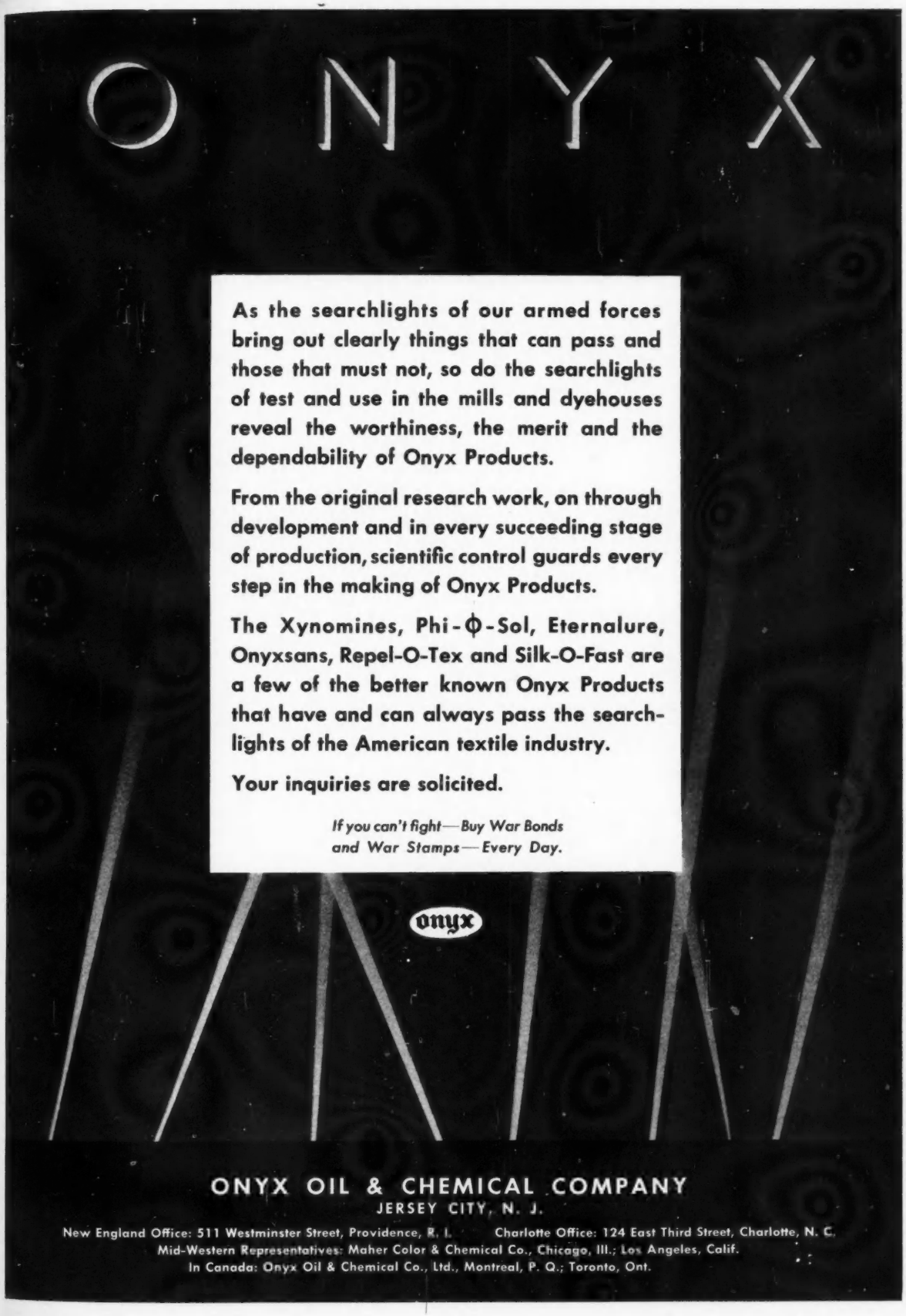
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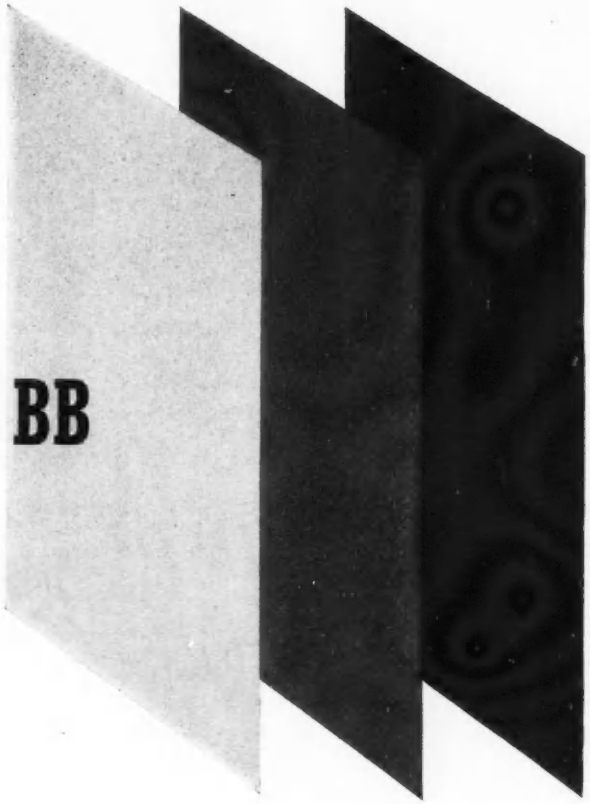

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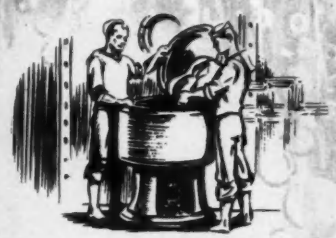

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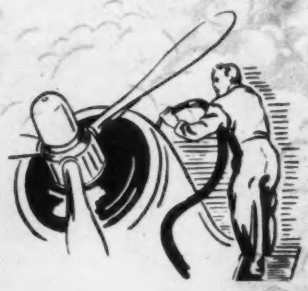

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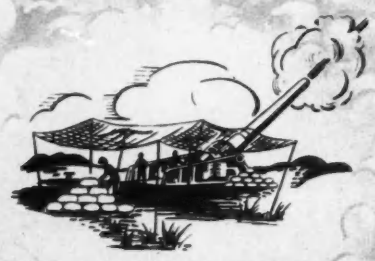

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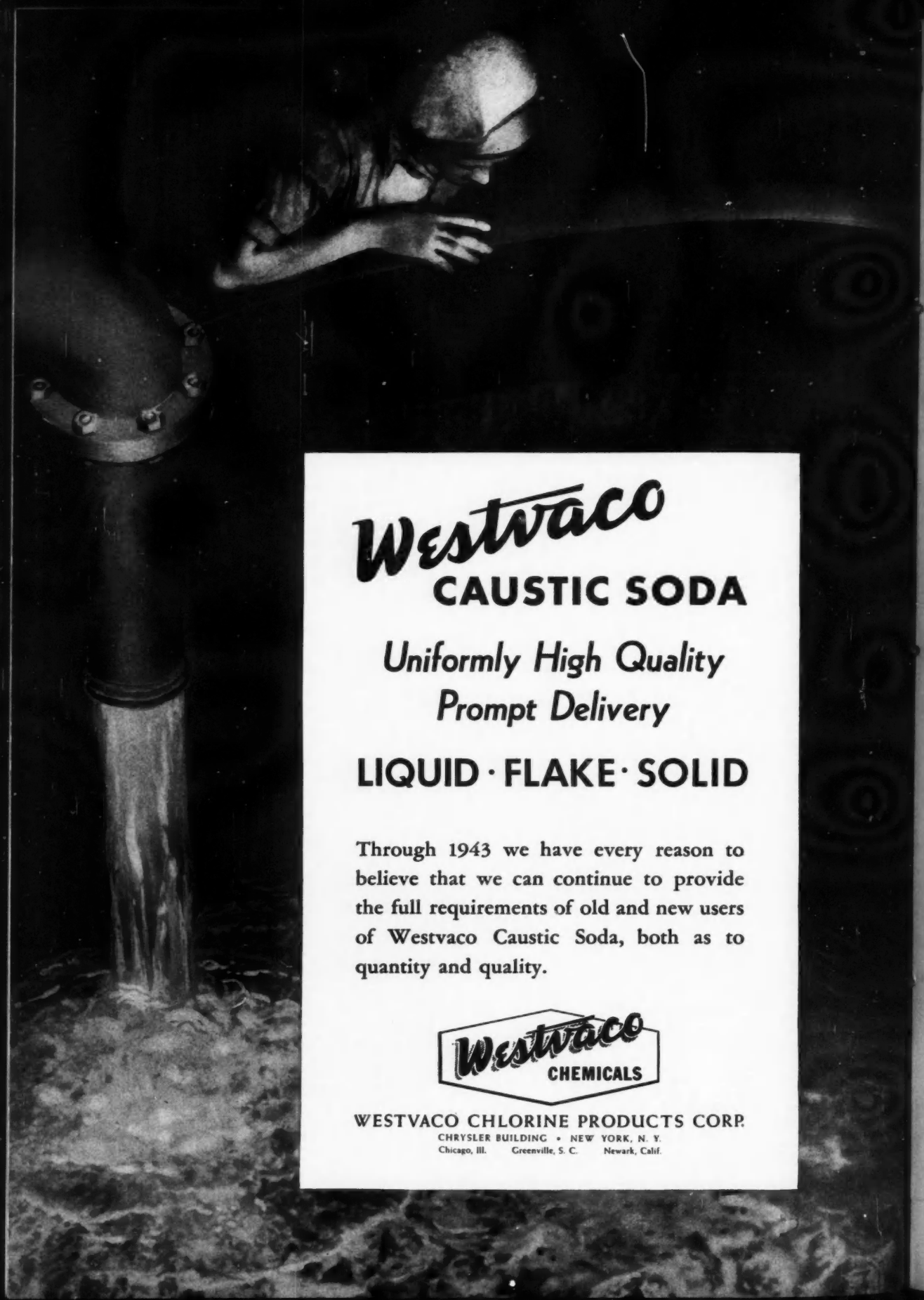

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FEBRUARY 15, 1943

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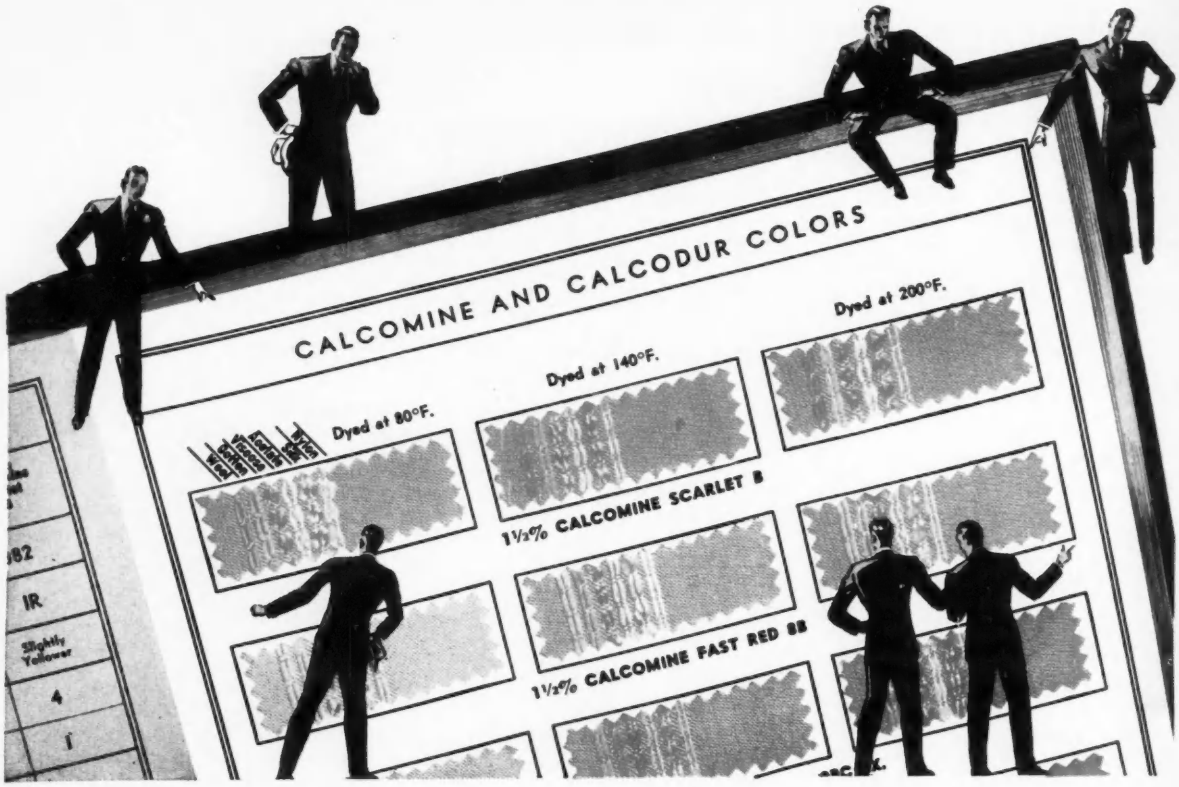

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DYESTUFF REPORTER
VOLUME 32 FEBRUARY 15, 1943 NUMBER 4

THE QUANTITATIVE ANALYSIS OF COTTON–VISCOSE RAYON MIXTURES

FRANK P. GREENSPAN and SIDNEY M. EDELSTEIN
Hart Products Corp.

I. INTRODUCTION AND SUMMARY

RECENT years have seen a vast increase in the use of staple fiber mixtures in the textile field, necessitating greater attention to their analysis. While convenient methods of separation exist for most fiber combinations, the analysis of cotton viscose rayon mixtures has proved to be troublesome because of the chemical similarity of the two celluloses. Various procedures have been proposed for the analysis of such mixtures. Lloyd and Priestly[1] have suggested that rayon can be separated from cotton by treating the mixture with 30 per cent sulfuric acid for 20 minutes at 50° C.; the rayon is dissolved, the cotton remains unattacked. Calcium thiocyanate solutions (sp. g. 1. 35-136), acidified with acetic acid, have been used by Mease and Jessup[2] for removing rayon quantitatively from rayon-cotton mixtures. Hawlett and Urquhart[3] reported that sodium zincate solutions dissolved rayon at 14° C. but that it did not materially dissolve cotton. Recently, McKay[4] has suggested the use of cold caustic soda solution for dissolving viscose rayon from mixtures of rayon and cotton.

While varied claims of accuracy have been advanced for each of these methods, it is the authors' experience that none satisfies the requirements for a simple routine analysis. The use of 30 per cent sulfuric acid as a "solvent" for rayon in rayon-cotton mixtures has been shown to give inconsistent and unreliable results[5].

The methods employing calcium thiocyanate, sodium zincate, and cold caustic soda solutions are based upon the slow swelling and dispersing action of these reagents on rayon and require exacting conditions of temperature control, concentration, thorough and continuous agitation, and tedious attention throughout. It is the opinion of the authors that there is a need for a simple, reasonably accurate method of analysis for viscose rayon-cotton mixtures.

A radical departure from past methods of rayon-cotton analysis has been made by the authors using adsorption measurements. It has been found that viscose rayon adsorbs more barium hydroxide from dilute solutions of barium hydroxide than does cotton. Work on a large number of viscose rayon samples from various sources showed that the ratio of the barium hydroxide adsorbed by viscose rayon to that adsorbed by a standard cotton yarn under identical conditions was fairly constant and the method herein developed is based on this finding. This adsorption ratio when obtained under a particular standardized set of conditions and multiplied by 100 is known as the Barium Activity Number[6]. All unmercerized cottons also give a constant though different Barium Activity Number.

Since the adsorption of barium hydroxide by rayon or cotton from dilute solutions varies with the concentration of barium hydroxide present in solution at equilibrium, adsorption values in the form of Barium Activity Numbers had to be corrected to the same final equilibrium concentration of barium hydroxide. Barium Activity Numbers corrected to the same equilibrium concentration of barium hydroxide have been designated Hydroxide Adsorption Numbers. It has been found that a Hydroxide Adsorption Number of 348 could be assigned to all viscose rayons, with a negligible error, and thus this Hydroxide Adsorption Number is more than threefold the Hydroxide Adsorption Number of 100, shown by unmercerized cottons. An improved procedure for the measurement of these values has been developed. According to this new method, the Hydroxide Adsorption Number of the unknown sample is determined and the percentage of each fiber is calculated from this result and the constant hydroxide number of 100 for cotton and 348 for viscose rayon. In mixtures of rayon and cotton containing also wool, or silk, or both, the silk and wool may be removed by treatment with hot 5 per cent caustic potash or soda, and the Hydroxide Adsorption Number determined on the rayon-cotton residue. The treatment with caustic has been found to have no effect on the Hydroxide Adsorption Numbers of rayon or cotton.

Barium Hydroxide Adsorption studies have previously been made with cotton[6] and the Hydroxide Adsorption Number of cotton could easily be obtained from this data. In order to obtain the value for viscose rayon, the Hy-

droxide Adsorption Number on a large number of viscose rayon samples were determined. Part A of the Experimental give the results of this investigation.

II. THE HYDROXIDE ADSORPTION NUMBER OF VISCOSE RAYON AND VISCOSE RAYON-COTTON MIXTURES

Edelstein[6] in a study of the adsorption of barium hydroxide by cotton (mercerized and unmercerized) from dilute barium hydroxide solutions showed that under identical conditions the adsorption by unmercerized cotton was a constant regardless of source, and whether dyed or undyed. Edelstein defined this adsorption term, i.e., the Barium Activity Number, as 100 times the ratio of the quantity of barium hydroxide adsorbed by the sample under test to that adsorbed by a standard unmercerized cotton run under the same conditions, or Barium Activity Number $= 100 \frac{A_s}{A_c}$ where A_s = mg. equivalents of barium hydroxy adsorbed by a given weight of sample, and A_c the mg. equivalents of barium hydroxide adsorbed by the same weight of cotton run as reference. For all unmercerized cottons, the Barium Activity Number was 100. The same author pointed out that fully mercerized cotton had a Barium Activity Number of 165 and used this information to evaluate the degree of mercerization of commercially mercerized samples.

When the Barium Activity Numbers of viscose rayon or viscose rayon-cotton samples are determined, we find that because of the greater barium hydroxide adsorption shown by rayons, we have at equilibrium in the flask containing the rayon a lower concentration of barium hydroxide than exists with the standard cotton run as reference. Since the barium hydroxide adsorbed by the rayon or cotton is dependent upon the amount present in solution at equilibrium, it is evident that we have actually determined adsorption values for rayon or rayon-cotton mixtures, in the form of the Barium Activity Numbers, for very different concentrations than was done for unmercerized cotton. With the latter, the equilibrium concentrations of barium hydroxide for bath sample and cotton reference are the same. In order to compare these values properly, the adsorption had to be corrected to the same final concentration of barium hydroxide. Barium Activity Numbers corrected in this way have been designated Hydroxide Adsorption Numbers. For unmercerized cottons, the Hydroxide Adsorption Number is equal to the Barium Activity Number, and thus the Hydroxide Adsorption Number for all unmercerized cottons is 100. The Hydroxide Adsorption Number for rayon or a rayon-cotton mixture differs from its Barium Activity Number.

In an unpublished paper, Edelstein has shown that the adsorption of barium hydroxide by cellulose whether in the form of rayon, cotton, or unmercerized cotton obeys the following empirical Freundlich-type adsorption equation:

$$\frac{C^{.7183}}{A} = K$$

where, C (concentration) = 100 X final normality of barium hydroxide in equilibrium with the cellulose.

A (adsorption) = mg. equivalents of barium hydroxide adsorbed by cellulose in equilibrium with final normality of barium hydroxide.

$\frac{c}{100}$

K = an adsorption constant

This fundamental equation enables us to correct the barium hydroxide adsorption values, "A," for rayon and cotton to the same final concentration of barium hydroxide:

$$K = \frac{C_1^{.7183}}{A_1} = \frac{C_2^{.7183}}{A_2} \text{ or } A_2 = \frac{A_1 C_2^{.7183}}{C_1} \quad \text{Equation I}$$

where A_1 = adsorption found at concentration, $\frac{C_1}{100}$

A_2 = corrected value for adsorption at standard final concentration, $\frac{C_2}{100}$

The standard final concentration of barium hydroxide to which all adsorption values are to be referred has been selected as 0.1802N*.

By definition, the Hydroxide Adsorption Number (sample) $= \frac{100\ A_2\ \text{(sample)}}{A_2\ \text{(cotton)}}$

Using Equation I, it can be readily shown that the Hydroxide Adsorption Number is given by the following equation:

$$\text{Hydroxide Adsorption No.} = K \frac{\frac{\text{B-E}_s}{W_s} \frac{E_c^{.7183}}{E_s}}{\frac{\text{B-E}_c}{W_c}} \quad \text{Equation II}$$

where

W_s = wt. of sample; B = ml. of hydrochloric acid for titration of 10 ml. blank barium hydroxide.

W_c = wt. of reference cotton; E_s = ml. of hydrochloric acid for titration of 10 ml. barium hydroxide in equilibrium with unknown sample.

E_c = ml. of hydrochloric acid for titration of

*This value was taken because it was the final concentration of the reference cotton found in the original experiments.

10 ml. barium hydroxide in equilibrium with reference cotton.

K = a constant, depending upon volumes of barium hydroxide solution used for adsorption measurements.

Viscose rayon has been shown to have a "constant" Hydroxide Adsorption Number of 348; cotton, a constant Hydroxide Adsorption Number of 100. Accordingly, the % Viscose Rayon in an unknown cotton-viscose rayon mixture is given by:

$$\% \text{ Viscose Rayon} = 0.4032\ K \frac{\dfrac{B\text{-}E_s}{W_s} \dfrac{E_c}{E_s} .7183}{\dfrac{B\text{-}E_c}{W_c}} - 40.32 \qquad \text{Equation III}$$

It is thus seen that the % Viscose Rayon is simply expressed in terms of the ratio of the adsorption of barium hydroxide (expressed in ml. of hydrochloric acid) per gram of sample, $\frac{B\text{-}E_s}{W_s}$, to that per gram of reference cotton, $\frac{B\text{-}E_c}{W_c}$, and a factor of equilibrium concentrations similarly expressed, $\frac{E_c}{E_s} .7183$

III. PROCEDURE

Reagents

(a) 0.05N hydrochloric acid standardized against sodium carbonate.

(b) approximately 0.25N barium hydroxide. $Ba(OM)_2$

(c) Unmercerized American cotton for reference.

The barium hydroxide reagent is prepared by shaking distilled water with slightly more than the calculated quantity of barium hydroxide, allowing it to stand overnight in a stoppered bottle, and then siphoning the clear solution into a clean storage bottle.

Method

1. The unknown sample and a sample of grey cotton yarn (any unmercerized cotton may be used—preferably unbleached) are simultaneously refluxed with carbon tetrachloride for one hour, air dried, and scoured as follows:

The samples are boiled for 1 hour in a liter of water containing 10 gms. of a neutral soap (olive) and 2 gms. of soda ash, washed repeatedly in warm water until free from soap and alkali i.e., until neutral to phenolphthalein, squeezed and dried.

Note: The entire scouring procedure may be modified to suit the particular finishes on the materials under test. If a large amount of starch has been used in finishing the fabric, a 0.5%-1.0% solution of a starch liquefying enzyme is used for 30 minutes at 50°C.

2. 2 g. samples are dried at 105-110°C. in an oven, using weighing bottles, to constant weight and transferred rapidly to 250 ml. Erlenmeyer flasks which are quickly corked. (It is possible to use tightly corked flasks directly as weighing bottles.)

3. 30 ml. of N/4 barium hydroxide are added to the flask containing the standard cotton yarn and in like fashion 50 ml. of N/4 barium hydroxide to the unknown sample. The flasks are stoppered immediately and kept for about 2 hrs. in a large basin of water at 20-25°C. (room temperature) with shaking at frequent intervals.

4. After 2 hours, 10 ml. of solution are withdrawn from each flask and titrated in 125 ml. flasks with 0.05N hydrochloric acid (HCl), phenolphthalein being used as the indicator. 10 ml. of the N/4 barium hydroxide solution are also titrated as a blank. *Note*: An automatic burette is most convenient for the addition of the barium hydroxide solution to the samples. The air outlet must be equipped with an absorption tube containing soda lime to remove carbon dioxide. The latter must not be allowed to enter any burette that might be used, because formation of barium carbonate not only affects the concentration of the reagent but forms a film which interferes with burette readings.

A cork is fitted to the bottom of the burette in such a manner that the 250 ml. Erlenmeyer flasks containing the samples under test are locked into place without exposure to air during the addition of barium hydroxide. Suitable pipettes may be substituted for the burette for the barium hydroxide addition.

For the removal of 10 ml. of barium hydroxide when equilibrium has been reached, 10 ml. pipettes are used. It is well to use the same pipette, burette, etc., throughout each determination. The hydrochloric acid burette is likewise equipped with a cork to which the 125 ml. flask can be attached during the titration of the 10 ml. aliquot portions of barium hydroxide, thereby eliminating titration errors resulting from carbon dioxide absorption by the alkaline solution.

All determinations should be made in duplicate on the sample and on the reference cotton. A large number of analyses on different samples can be run simultaneously. In such cases the same cotton yarn run alongside serves as the reference sample for all.

Calculations

For the procedure as outlined above, K, the constant of Equation II becomes 166.66 and the factor in Equation III for the % viscose rayon becomes 67.2, i.e., 0.4032 x 166.66. The % viscose rayon in a viscose rayon-cotton sample may now be calculated as follows:

$$\% \text{ Viscose Rayon} = 67.20 \frac{\dfrac{B\text{-}E_s}{W_s} \dfrac{E_c}{E_s} .7183}{\dfrac{B\text{-}E_c}{W_c}} - 40.32 \qquad \text{Equation IV}$$

In a typical analysis of an unknown viscose rayon-cotton mixture, the following results were obtained:

Titration with approx. 0.05 HCl

B = titration of 10 ml. of blank barium hydroxide = 40.84 ml.

W_s = oven dry weight of unknown sample = 1.9000 g.

W_c = oven dry weight of reference cotton = 1.9428 g.

E_s = titration of 10 ml. of barium hydroxide in equilibrium with sample after 2 hours = 34.30 ml.

E_c = titration of 10 ml. of barium hydroxide in equilibrium with reference cotton after 2 hours = 35.16 ml.

Therefore,

$$\% \text{ Viscose Rayon} = 67.20 \frac{\frac{40.84-34.30}{1.9000} \quad \frac{35.16}{34.30}}{\frac{40.84-35.16}{1.9428}} = 40.32$$

.7183

% Viscose Rayon = 40.2%.

In like manner the per cent Viscose Rayon is calculated from the duplicate run of reference and sample. The average of the two results thus obtained is used as the per cent Viscose Rayon of the unknown sample.

IV. EXPERIMENTAL RESULTS

A. Hydroxide Adsorption Number of Viscose Rayon

The Hydroxide Adsorption Number of 348 assigned to viscose rayon as a constant to be used in the analysis of viscose rayon-cotton mixtures was obtained from a study of the Hydroxide Adsorption Numbers of a large number of viscose rayon samples. Adsorption measurements were made of viscose rayon yarns from various manufacturers, including bright, semi-dull, and pigmented yarns and also of viscose rayon fabrics of various constructions.

Following the procedure outlined, but substituting the viscose rayon sample under study for the unknown viscose rayon-cotton sample, the Hydroxide Adsorption Number of the viscose rayon is simply calculated from Equation II, the value of K being 166.66. All runs were made in duplicate. The figures given in the accompanying table are average values.

Yarn	*Hydroxide Adsorption No.*
Industrial Rayon 100/40 Bright	369
Industrial Rayon 150/40 Bright	368
Industrial Rayon 100/50 Dull	367
Industrial Rayon 150/40 Dull	354
American Viscose 60/60 Bright	345
American Viscose 100/60 Chalkelle (Dull)	335
American Viscose 150/40 Chalkelle (Dull)	323
American Viscose 100/40 Dulesco (Semi-dull)	320
American Enka 150/90 Englo (Dull)	335
American Enka 150/40 Briglo (Bright)	360
American Enka 100/40 Briglo (Bright)	368
Tubize Chatillon 150/40 Dull	360
Tubize Chatillon 150/40 Bright	360
DuPont 150/40 Semi-dull	335
DuPont 150/40 Dull	325
DuPont 150/40 Bright	339
North American 150/42 Bright	349
North American 150/42 Semi-dull	339
North American 150/42 Dull	356

Fabric	*Hydroxide Adsorption No.*
Rayon French Crepe	355
Spun Rayon Challis	365
Rayon Taffeta	334
Rayon Satin	346
Rayon Sheet	366
Rayon Taffeta	351
Rayon French Crepe	338
Spun Rayon Shantung	341
Printed French Crepe	326

Average Hydroxide Adsorption No. of Rayon = 348 (from yarn and fabrics)

% average deviation = 3.7%

B. The Analysis of Viscose Rayon-Cotton (Unmercerized) Mixtures

A large number of analyses of viscose rayon-cotton samples have been made with the procedure given. A typical analyses has already been illustrated in the procedure.

To check the accuracy of this new adsorptionometric method of analysis: (1) analyses were run on known viscose rayon-cotton mixtures of 5 per cent rayon to 95 per cent rayon, prepared by mixing a known weight (oven dry) of cotton broadcloth and a definite weight (oven dry) of a spun rayon challis (Table I); (2) analyses were run on viscose-cotton fabrics in which the rayon was to be found entirely in either the warp or filling, and thus could be analyzed by a hand separation of the rayon from the cotton, the percentage being based upon oven dry weights Table II).

TABLE I
(A Mixture: Cotton Broadcloth, Spun Rayon Challis)

	$Ba(OH)_2$ Method		
Actual %		*Found %*	
Rayon	*Cotton*	*Rayon*	*Cotton*
84.5	15.5	87.0	13.0
94.6	5.4	98.3	1.7
66.3	33.7	68.7	31.3
25.0	75.0	24.6	75.4
5.2	94.8	4.8	95.2
39.8	60.2	39.3	60.7
10.2	89.8	9.9	90.1
26.2	73.8	26.0	74.0
24.7	75.3	22.6	77.4
48.9	51.1	48.3	51.7

Titrations of aliquot portions of $Ba(OH)_2$ (removed from solutions in contact with rayon or cotton) at intervals of ½ hr. indicate equilibrium has definitely been reached at the end of 2 hours. Frequent shaking at 15 minute intervals hastens the establishment of equilibrium conditions.

Temperature has a pronounced influence on the adsorption of Ba $(OH)_2$ by the sample under test. However, the Barium Activity Number of the sample will remain constant with a change in temperature since both the sam-

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FEBRUARY 15, 1943

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OPEN FORUM

Conducted by the RHODE ISLAND SECTION on the Subject of

"The Employment of Women in the Textile Industry to Replace Men Who Have Entered the Armed Services"

NOVEMBER 27, 1942

Mr. King, Chairman: We are not looking into the future on tonight's question. We have got the situation right at hand. I think we will come out of this meeting with some good ideas, as we have so many good speakers. I am grateful to our Vice Chairman for developing the idea of an Open Forum before this Section. I think it is something we have needed for a long time. He is speaking tonight on the subject pertaining to women employed in the cotton piece goods industry, pertaining principally to dyeing, printing and finishing of cotton piece goods. Harold Sturtevant has had a good many years' experience in a managerial capacity coupled with experience "on the road," as we call it, installing technical processes. He is well qualified to present his subject before us. I now present Harold B. Sturtevant of the Albi Chemical Company.

COTTON PIECE GOODS INDUSTRY

Mr. Sturtevant: Since we had decided on this subject, it is apparent that many others have the same thoughts in mind and considerable has been published on the topic in both the newspapers and the trade magazines. It is our purpose during this meeting to bring out the actual places where women are now being employed for the benefit of all concerned. Although there may not be similar cases in your plant, we hope that it will prove suggestive and help to get around the present shortage of labor by using women wherever possible. I shall try to cover the subject from the viewpoint of a travelling man who comes in contact with a number of plants and their various departments.

Over a year ago, I happened to be in one plant and was surprised to note the number of girls employed in the laboratory staff. One of these was a graduate chemist doing analytical work. The others were high school graduates who had been trained to do routine laboratory work; this included some microscopical examinations and the measuring of fiber lengths and thicknesses. Since that time we have all heard of other cases, and some of our members probably have women in their laboratories, some of whom were trained for the work, and others were trained in the lab.

In cotton and rayon piece goods finishing plants, there are a number of women being used as inspectors on the take-off end of drying cans such as those in the white room, or those driers following printing machines. Women have always been used in the grey departments. The bleach house and dye house, which are wet processes, generally have poor working conditions for women. In practically all the other departments, more women are being used. In many cases that has been accomplished by having the men working with them take care of the heavier work such as the lifting, moving of boxes or rolls of cloth up to and from the machines.

Women have for years guided cloth through the wet frames and what is to prevent using the same general plan of work on the short frames, calenders, and other processes? The men of the department could bring the work to the machines while the women can feed the cloth into the machines. Others can inspect it coming off while both men and women can watch the cloth for damages and running difficulties that are always cropping up, stopping the machines if necessary when something goes wrong. I know of plants which are working this way and are going to carry it further.

The finish and put-up departments have always employed a large percentage of women and present conditions will extend this much further. Women, suitably trained, make excellent and neat folders, especially of lighter weight fabrics. Some plants still use males to run the hookers but are really needed only to take off the heavier pieces out of the machine. Men have run doublers-and-rollers but women can easily handle small pieces from such machines. Again, in the packing and invoicing, the work lay-out can be replanned so that women can and are packing the finished goods while the men do the heavier lifting, hauling, and trucking.

Some of the things I have mentioned in this brief account have been done in some plants a long time before the present emergency while others may be new to you. I offer them to you for what they are worth and trust that some of you may get ideas that may be of some help. In closing, let me say that the further use of women in industry has started something and we do not know where it will end.

Mr. King: Thank you Mr. Sturtevant, your points were well expressed. Our next speaker on this subject is a representative of the worsted industry, Carl Medde, who has had a great deal of experience at Lorraine Mfg. Co. and other plants. Mr. Medde has worked as chemist,

consultant, and technician, and I think he is a man who is very well qualified to discuss this problem.

WORSTED INDUSTRY

Mr. Medde: I haven't a formal paper but simply a few notes, so my talk will be somewhat extemporaneous. I am going to call attention to a few places where women might be used, and some where they are already being used. In the finishing plants of large worsted mills, the starting point of the finishing processes is the grey or make-up room. Women might be used there but for the much heavy lifting and moving, so I think there is not much opportunity for employment of them there.

The wet and other finishing such as fulling, scouring, crabbing, and peroxide bleaching, is a pretty sloppy job, even for men; and there is a great deal of heavy lifting to be done. There is also the possibility of dermatitis; and so I believe there is not much likelihood of women being used there.

In piece dyeing, however, the loading of a kettle and the unloading isn't very laborious. The taking of patches for sampling and the making of additions could be done very simply and handily by some women. Naturally, the more athletic or the physically stronger-proportioned women would be selected. However, the lifting of the dye solution barrels or containers would have to be done by men so a considerable number of men would still be needed for the heavier work.

In yarn or warp dyeing, which are in the same field, there would not be any great use of women except for those mills which are equipped with mechanical means of loading and unloading the kettles. In the yarn-package dyeing, the use of women for back-winding, which is considered part of the dyeing operation, is very common. The next step, extraction, offers little possibility of employment of women because of too many heavy trucks from the dye kettle area and piece goods field that have to be pushed to the extraction apparatus.

There isn't any reason at all why women can't be profitably used on dryers. Automatic feeding is so common now that women can feed the worsted pieces into a dryer with no more effort than a man does, which sometimes isn't much. Probably two men would still have to be in a room with four dryers. As to cleaning the dryers, perhaps women can do a better job than some men do.

In the dry finishing field, I understand that there are places where women shear tenders have been employed, in one case ever since the last war. There is no reason why women can't run a press, dewing machine, or even a decater. Here again, a small number of men would be needed to move trucks and handle cuts of cloth.

Women can and do act as examiners. One of the biggest mills had women examiners even before the last war and still has them; and they are fully as expert as men, some of them more so. Regarding speckers, we all know that is best done by women. I know of a number of mills which have confirmed that experience just recently. Women have it all over the men for surety of doing the job right.

So far as packing, measuring, and folding are concerned, there is no question why women can't do that just as well as men. There again the arrangement of the pieces coming to the packer requires some male help; but if the job is studied carefully, arranged and synchronized so that the pieces of cloth can arrive at a place where the women operators can handle them, there is no reason why women can't do the job very well.

It is my conclusion that in fifty per cent of the cases in finishing, men might easily be replaced by women. They would need some training but so did the men when they first started their jobs. At present, in the majority of cases, a careful and considered training plan is instituted. That is all, gentlemen.

Mr. King: That was very well presented. After hearing only two speakers, I am just about convinced that man is quite dispensable!

The presentation of this subject from the viewpoint of the cotton yarn industry was assigned to Thomas Goulet of the Woodlawn Finishing Co., who has prepared a brief paper. He was unable to be here tonight, and so I shall ask our Secretary to read Tom's paper for us.

COTTON YARN INDUSTRY

The paper read as follows:—

Women have always performed a large part of the work in yarn dyeing. For years they have done most of the winding, spooling, copping, bobbin winding, tubing, beam winding, and loading and unloading of skein dryers. Women have also done most of the inspecting and wrapping. Today, foremen and managers are giving women a better chance to help them in their work. The following are the new jobs in yarn dyeing that the writer knows or has heard that women are doing.

(1) Loading and unloading yarn on perforated tubes for package dyeing. In this work women can do almost as much work as men.

(2) Extracting dyed packages in single-package extractors; loading the dryer trays or racks. Here, women do just as well as men. If package extraction is done in a large extractor that holds 200-300 packages, it is much harder work and not many women can stand the constant reaching in and out of a large extractor.

(3) Women do a very good job of packing dyed packages in cartons or cases for shipping.

(4) Another new job done by women is doubling warps. For example, a 500-yd. warp is doubled twice to make a short dye run of 125 yards.

(5) A woman can run warp dry cans or feed a warp festoon dryer successfully.

(6) On the machines that take off the water bands from dyed warps, women do more work than men.

(7) One dyehouse uses women exclusively on their warp-slitting machines.

(8) In most yarn dyehouses, yarn is prepared for dyeing by boiling off in a kier. Women take the skeins from bales or cases, then cinch or twist them into loose bundles that will not tangle in the kier during the boil-off.

(9) In one dyehouse that was airy and has a dry floor, women are learning to dye all small lots up to 50 lbs. on a Buhlmann skein-dyeing machine. They enjoy the work because to some it is a thrilling experience to do a job that has so much eye appeal. Applying beautiful color evenly and to an exact match of a standard shade is very fascinating work.

(10) A new job for women is to run a skein mercerizing machine. Women do an excellent job of carefully opening the skeins before loading them on the machine.

(11) If the Klauder-Weldon skein-dyeing machines are in a well-ventilated room, women working in pairs can load and unload the machines.

(12) One skein dyehouse has two husky women running the skein extractors, and as you can imagine, handling 5-20 lb. bundles of yarn makes them muscular; so that now the boys remark "what a physique!" instead of, "what a shape. . ."

(13) Finishing off dyed samples and taking them to the head dyer for instructions can be done by some women.

(14) Some ambitious women will learn their jobs well so that they can supervise the work of the other less ambitious men and women. Supervision does not require any muscle, it requires, however, a well balanced mind which may be possessed by women as well as by men.

(15) Preparing formulae in the laboratory before dyeing large lots is a job that can be well done by an intelligent woman. She must be able to calculate well and it helps a lot if she has had at least a high school education.

We must not expect women to work in the close quarters of some crowded, hot, and badly ventilated rooms. Men can stand these bad conditions much better than women. In nearly all dyehouse work, moving and lifting heavy objects is often required; and it is usually necessary to have a man working in team with women.

Mr. King: We now call on Charles Sedgwick, to present his point of view from the woolen industry.

WOOLEN INDUSTRY

Mr. Sedgwick: Let me remark at the beginning—the Ladies, God bless 'em. It is very true that we are faced today with a very serious problem. The textile industry is behind again as it usually is. The mechanical trades, machine shops, automobile factories, etc., could see what was coming. They provided schools to train women to take the place of men in their various factories. Whether the textile industry could see this far or whether again it was a matter of money, as usually it is, anyway, they did nothing to prepare women for work in our textile plants. The defense plants—perhaps the most prominent are the airplane factories—have found by careful survey that a woman given a job and taught that job, can do a far better job than men, because they can stay at a tedious job longer than men.

I would like to skip very rapidly through a woolen mill, department by department.

Women inspectors have been used for a good many years. In the scouring of the wool, there is nothing which would prevent the use of women as scourers, unless it is the chemicals which are used and the danger of dermatitis on women's skin. Recently I heard a woman speaking for an insurance company, who pointed out that women's skin is far more tender than men's, and far more susceptible to dermatitis. She stressed the point that we would have to be very careful in employing women where chemicals are used, especially solvents of any kind, for it seems that a woman's skin has an affinity for solvents, Apart from this, I do not see why women could not be used in wool scouring.

There is nothing which a woman can't do in the picking or winding departments unless it is lifting bags. Statistics have proven that two women can lift up to 190 pounds. Of course, you have to pick your women—husky women for heavy jobs, and leave the shapely ones to be looked at!

Let us look for a moment into a raw stock dyehouse. If a mill is fortunate enough to be equipped with the latest type of machinery, such as Franklin Process machines, there is no reason why a woman can't run them. If there are extractors or squeeze rolls, a woman may be in danger of strain if lifting by hand.

There are already factories which employ women in the card room, feeding the cards, running the finishes, taking care of the alleys and the oiling. The only part where I suggest not to use women is in the laborious work of stripping the heavy rolls by hand.

In the spinning room, worsted and woolen mills have long used women. At one mill, women were tried during the last war, rather unsuccessfully, on jackspool twisters. Today we have three women who are spinning this way very nicely and are making from two-thirds upwards to the full pay which a man makes. As time goes on, they will become just as good in production as a man. We now have twenty-four women at our plant that are being taught to spin. Some will never be good spinners, while some will turn out to be very good ones.

Except for the lifting of heavy spools into the dressing frame, there is no reason why women can't do the warp dressing. But for this lifting, we wouldn't have men there at all.

In the days when there were one or two looms per person, women ran them. Automatic looms of today are harder as more are run, but it has been tried and proved successfully that a woman can run the automatic loom.

There are jobs which the women can do and one's she can't do in wet and dry finishing and in piece dyeing. In England, it has been necessary to depend on women very

largely. A very good friend of mine who is connected with a plant in Yorkshire wrote me not long ago that he was running his plant entirely on female help with a few old men who had some heavy work to do.

We are faced today not only with the problem of using women in our industry but 'ere long we are going to be faced with the problem of *getting* women. The average pay in the woolen industry is 65c and in the defense industries it is 75c to 80c. A woman is not going to work in a textile mill for 65c if she can go other places and get 5-10 cents an hour more. Already in our town there are no women who are willing to come into the mill for work. We have to draw most of our workers from the city, and are finding it hard to get women to come out to our town to work. We are now employing a good many colored women and they are doing a fine job. Our young men are going away continually and I am perfectly sure that the textile industry is not going to let itself down. We are going to utilize this woman power; and we are going to do everything humanly possible as our part in helping to win this war.

Mr. King: Thank you, Mr. Sedgwick, for a stirring talk. Your ideas pertaining to the training of women can serve as a proper introduction for our next speaker.

We have been very fortunate in getting William D. Fales, head of the Textile Department, of the Rhode Island School of Design to present "The Present Training of Women." I am glad at this time to present Mr. Fales.

THE PRESENT TRAINING OF WOMEN

Mr. Fales: The title of my part in this forum tonight is "The Present Training of Women in the Textile Industry" and I am sorry to have to report that at the present time there is no organized plan such as the machine industry has for the training of women. Much has been said here tonight concerning the actual woman worker and very little concerning the woman technical worker or the supervisory women you gentlemen have got to have.

We have tried to start such programs. We have had the cooperation of some manufacturers; and we have run into a number of difficulties—so-called "red tape." We had a very ambitious plan for training women weavers in the narrow fabrics industry; the industry to supply all the equipment necessary and a place in the plant for it; then government red tape just stalled the whole business. Nothing could be done with the product which might come from such a training program except to throw it away and that just stymied the whole plan. There is a difference between training a person to operate a lathe and training a person to operate a loom. In the first place there is a small piece of steel which can be worked until there isn't any steel left and there is not much of a loss. This is not true in the textile industry where waste and bad goods are made to a far greater extent.

The training of the worker is best taken care of by the industry itself. However, I do think that there is a definite place for a school. There are ten textile schools which are allied to a certain extent and are working together as a unit. I believe the industry should take more advantage of these schools than they now do.

The machine industry is much more fortunate by the very nature of their work. To show you how well that is organized and the kind of work we are doing—and to offer it as a possibility for you to think of in relation to textiles—we have under the National War Labor Training Program a course in operating various machines; and we are continually turning out a steady stream of women into that particular field. Under the Engineering Science Management War Training Course, of college grade, we have a general drafting course. We have a tremendous number of women who are going into that particular field, and they are going out continually in a stream. Newport Torpedo Station, for example, is taking a great number of them. Some of these people as they develop in General Drafting are being placed in a Tool Design course which is quite an advanced course for a woman; and they are doing a splendid job. In addition to this, we are running our regular day and evening course and a tremendous number of girls in our school have transferred over to these machine courses. They have eliminated from their programs their regular subjects; they are sacrificing their life's work to go into this so-called machine tool industry as their contribution to this war effort. Plans are afoot to take 30 women from a certain industry here and train them for inspecting and gauging operations in a plant doing war work. Some of these people are to be assigned to us, and in some cases are even subsidized by the employer. I know of one girl who signed a contract this week that provides that at the end of her training period she goes to work at $1780.00 a year.

One of the reasons we can't help textiles at the present time is because they are calling on us for highly trained persons. These people simply don't exist, especially in the chemistry, dyeing and finishing fields, where our calls are coming from. Our supply was exhausted a good deal over a year ago. Since this fall semester, I have had over 40 calls for girls to go into chemical laboratories alone. In regard to our men students, last year only one of our graduates went into industry; all the others went into the Navy. This year every boy in the School of Design is signed up in the Navy, in the enlisted Reserve Corps of the Army, or in the Marine Corps.

We all know that it takes a long time to train chemists; neither we nor any one else is able to train any chemists in a hurry. I think we should set up immediately some short courses for the training of women without the theory behind the actual operation. These women should come from the industry to be retrained in a short 6-8 week training course. We have several experiences in this line. I want to cite one: a young lady trained in my department and graduated 3 to 4 years ago went out as a successful

designer and was employed as such until a few weeks ago. A very good opportunity came in to us, and with the consent of her employer who realized that designing was going out, she was retrained in the course of two weeks so that she could go into classifying cotton, stapling with both hand- and machine-operated stapling machines; she could make comparisons with government standards and other necessary tasks along this line. She is doing a splendid job. What we should do in textiles is to have some well-defined objectives and then shoot for those objectives—individual jobs.

We should have young women to work who have a good high school record perhaps; someone who understands mathematics—a tough job for most girls. We should train her as a laboratory technician. As one mill man recently put it, "You have got to train women to take over all supervisory jobs in a mill, because we are going to lose all these men." A woman takes to precision work like a duck takes to water. They do need to be told and trained in how to tabulate results and to write records. What we should immediately try to do is to find these women in industry and start this short retraining or refreshing course.

At the present time we have about 25 girls in both day and night classes in textiles plugging away at the regular course. Most of them are in the chemistry field at our suggestion because that is where the calls are coming from; and we have to train some technicians who will get out into the laboratories and also fill supervisory positions.

Mr. King: Your thoughts were very well expressed, Mr. Fales. We have certainly heard a great many interesting points which should bring up a great deal of discussion. I shall now call on Mr. Sturtevant, the Chairman of our Program Committee, to lead the discussion.

DISCUSSION

Mr. Sturtevant: I see Mr. Tripp is here from the New Bedford Textile School. Would Mr. Tripp give us a few words about the two-year course for training women technically at his school?

Mr. Tripp: Recently we installed a two-year technical course for girls in textiles. These girls are taught some regular physical testing, some designing, general chemistry, and some dyeing and bleaching. We have been very successful in placing these girls, most of them were placed before the school term ended last June, with some girls starting to go out even in February. This year some of them have left school already. The local mill men get them and the class has been steadily diminishing so that we have only two left now! They were very successful even without their training!

Last year the Mechanical Department instituted a course for girls in machine shop practice. They put in a good many hours during the day as lathe operators. One factory in New Bedford takes every girl who completes the course. It would be fine if we could get the same cooperation from some of the textile men in the finishing game. The idea of training girls for technical jobs in laboratories is alright but where will we get them to train? If some of the mill men would come right out and say "If you will take a half dozen of girls in your school and give them a basic training, (such as Mr. Fales suggested) we will employ these girls at a specified salary" there would be something definite to start on and work with. The difficulty now is that girls can leave high school and make a lot of money without spending much time in school for such special training which will eventually pay less money than they can get in the mechanical industry. So the question I would like to bring up is: how can we attract these girls to the textile finishing profession? Or to get them to come to school to be trained?

Mr. Sturtevant: I think that uncovers a definite problem. Mr. Fales said some manufacturers were subsidizing the girls while in the training stage. Do any of the gentlemen here think that is possible in your plants?

Mr. Fales: Up to this year we had 114 evening students sent in by various plants with their expenses paid. A number of other mills which have done that have discontinued it this year because they haven't any men available. This should be carried on with women but so far they have not been able to attract them.

Mr. Davies: It is only within the last year or so that textile school graduates have been able to get a decent job. Even quite recently I was able to hire a textile designer, a graduate of a textile institute, for $18.00 a week. Now the demand has gone up but prior to this there was little appeal to training for the boys themselves.

Mr. Sturtevant: Times change rapidly and to take care of changing conditions, it seems agreed here tonight that women should be trained. If equipment can be obtained or made to take care of some of the heavy lifting in our plants, the training of the help for semi-skilled jobs is much better taken care of by the plant foreman; but the question of training women or girls for more skilled or technical jobs is important. The demand is surely there but they are not available because they are attracted by higher pay elsewhere. The Textile Industry or an association like ours must fill in that gap and bring forth ideas which the various textile schools can use to advantage.

Mr. Nelson: It seems to me that most of us are technical men in the textile industry. This group here should compose a letter endorsing the various schools which could teach women for laboratory work. We are losing our laboratory men and many of us have to work long hours. If the textile schools could have the endorsement of this organization, it would prepare us for the future. We are always late in the textile industry so couldn't we do this one thing before it is too late?

Mr. King: I think this suggestion is so good that I will take the position of considering it in the form of a motion.

Mr. Sturtevant: I will second the motion.

Mr. King: Our Sectional Committee will meet presently and take action on this suggestion as it is very much in accord with the subject discussed this evening.

Mr. Sturtevant: What is the possible future of women in these jobs after the war is over? I have said previously, we don't know where it is going to stop. We ought to consider this and get prepared to do something.

Mr. Joerger: Don't you think that the urge to build and make homes will come back again?

Mr. Fales: I believe in the future we are going to continue to have a highly trained group of women in all industries; but as Mr. Joerger said, we may get back to building more homes, and it is the natural thing for a woman to want.

Mr. Sturtevant: That is the main stabilizing influence on the whole problem, of course.

Mr. Shore, do you think you are going to keep your group of women working in your laboratory after the war is over?

Mr. Shore: My opinion is that women aren't adapted for this type of work; but once taught, they try hard. School training is out because we can't wait two years, we have to teach women in our own plant. We need the women *today*—not next week or next year.

Mr. Jackson: And I think it would be very difficult for girls down in the country to come to the city for school. Mr. Shore was talking about the physical testing laboratory and he has done a good job with very green girls out of high school.

Mr. Sturtevant: Have you found that women are more adaptable to routine testing?

Mr. Shore: Routine testing is best for women all around. If a girl has no mind for mathematics it is best not to put her on dyeing or other lab jobs.

Mr. Prisley: I agree that women are better adapted for routine, tedious tasks. I trained a girl once to measure diameters microscopically. I wouldn't want that job and no man could do it more than three days before throwing a fit! This girl would sit there by the day and it never bothered her a bit. She seemed very happy and once when I asked her if she weren't bored, she said she loved it. If a girl is at all inclined to be mathematical, a few weeks or months of training in precision measurements with without chemistry would make her a very likely prospect for a lab job. I know they can do it. I trained two girls in a laboratory but the mathematics is a stumbling block. As far as precision measurements are concerned, they have more aptitude than most men at the beginning.

Member: Schools are the most important and girls can't be taught in the lab! Standards are upheld better by teaching them in the schools, which are far superior to that taught in a plant.

Mr. Fales: I have had 27 years of training young people. I have handled probably 6,000 of those working in the textile industry nearby. The textile industry could do a remarkable job if they would; but there is a certain technique which comes only from experience in teaching and that technique we want to pass along. The busy laboratory technician in the mill, nine times out of ten, can't teach a new person how to do a certain job.

Member: One of the biggest troubles with our industry is that not enough time is given for these people in which to learn. In a machine shop, the women are paid 60c an hour to watch a man run a lathe. In most of the mills I have been in the management expects that the man hired in the morning should turn out as much production that same afternoon as a fellow who has been there ten years!

Mr. Tripp: I was talking to a textile man recently who was very short of spinners and I asked him if the school could help train some. He said, "No, my particular work is complicated and I don't think the school can help." But I suggested that we could teach them spinning and give them some foundation and with this basic training they would be given preference for they would at least have a little experience. The idea could also be applied to the problem of laboratory technicians. I think it is up to the mill men to help the educators with suggestions of the training needed. We would get many diversified answers but from them some sort of basic training could be devised. Mr. Fales and I have in mind a high school student who would get two months' basic training. We want to teach what you people want—it will be beneficial all the way through.

Mr. Jackson: There is a group of mill jobs in my plant right under my nose which I missed entirely until a bright girl in the office called them to my attention. For instance, we have a station wagon which we use to meet our customers at the train and bring them to our plant. She suggested that a girl be sent to the train instead of a man who usually does this. The customer was delighted to talk to a female for an hour and a half; and now no men are going to meet any more trains for our customers! We also have a girl who handles our payroll and goes to the bank. Two or three years ago we would have thought this couldn't be done by a girl.

Mr. Sturtevant: We know that there are many jobs in the mill office an intelligent girl can fill admirably if she is only given a chance.

Returning to the problem of lifting heavy material, can the mechanical equipment for these be built in your own machine shop, Mr. Sims?

Mr. Sims: Those things are available but we have to put auxiliary parts on. We have to make jobs easier for men because they don't want to work so hard after being on the job ten years!

Mr. Medde: The textile industry is very poorly laid out. There is a great deal of pulling and hauling of heavy pieces, at least in most worsted and woolen mills. At one mill a piece had to travel about five miles before it finally got to the packing. In our particular plant the great problem is the moving of these well loaded trucks from one place to another. A truckload of ten wet pieces is a tremendous mass of material which takes a broad back and lots of push to move.

Mr. Sturtevant: What about the monorail system? Is

it possible to obtain material for such equipment now?

Mr. Medde: For a good many years this system has been used on the raw stock dyeing machines.

Mr. Sturtevant: Is it possible that 50 per cent or more of the labor in a yarn dyehouse could be replaced by women?

Mr. Fletcher: I cannot give a positive answer but a large per cent could be replaced, though not 50 per cent. The loading and unloading of machines probably could be done, although as far as I know, it hasn't as yet. We have found that women work out much better than men in the shipping department. And they can take jobs that a man finds more or less tedious. Although we haven't employed women in our package dyehouse, I am not really qualified to say whether it can or cannot be done. In an emergency, many things can be done which didn't seem possible.

SUMMARY

A brief summary of the need, place, and training of women for the textile industry in light of what has been said above follows:

Women have always been used as workers and semi-skilled laborers in the textile industry but their employment will now increase greatly perhaps even to the point where they consist of half of the whole.

As machine tenders, women can be used to feed cloth into dyers, frames, and calendars; and also work at the take-off end. They can load and unload other dryers for skeins, warps, and tubes, dye kettles, and other dyeing machines. They have a place in carding, spinning, weaving and shearing operations, and are largely used in winding and spooling. In the put-up room, they run folders, measure, invoice, pack and ship. They are used as inspectors, for taking samples in the dyehouse, run other errands, for certain additional office jobs. Some who are ambitious and have a well-balanced mind become supervisors where they do as well as men.

For all these jobs, the working conditions have to be considered. Places which are usually wet, steamy, or close are not suitable for women who prefer rooms that are clean and dry. Where chemicals are used, the increased danger of dermatitis must be looked into. For heavy work, that involving lifting and pushing, it is still best to use manpower where mechanical equipment is not available, leaving the lighter tasks for the women.

The training of women for these kinds of jobs is usually to be left to the mills under their particular conditions though some basic training in trade schools, however brief, is very useful. More time and thoroughness of training women for their jobs is suggested.

To attract women to the textile industry, methods and inducements should receive serious consideration especially in the matter of adequate pay—adequate in light of the competition with other war industries whose higher rates make them more attractive, especially the machine shop operations. The matter of transportation may also be taken into account, as women would rather work near their homes. The use of colored people need not be neglected.

The problem of getting skilled technicians for the laboratory staff, such as chemists, analysts, those who do physical testing, control or microscopical work,—is even more difficult because here some basic training is highly desirable. Such specialists require longer training time. Graduates of high schools, of trade schools (both day and evening courses) and those of the college grade with some acquaintance with the textile industry are almost impossible to get.

The training of such girls and women can be done by the industry especially if it is a certain routine job of limited scope; but the teaching of a broader background to such specialists is best done with the acquired skill of the staff of established schools. Between them and the industry, there is no organized plan for the training of women. Some girls should be subsidized as men have been in the past, others could be re-trained for certain jobs quite quickly. Short, basic courses confined in scope but aiming at an individual kind of work is one approach towards a solution.*

It is well known that women are very suitable for routine testing as they have more patience and can do tedious and monotonous work without becoming bored or tired. They have less aptitude towards mathematics which keeps some of them from more advanced work.

With this group there is also the competition for their talent with other war industries which often offer the same or more pay with much less study or training.

The present urgency in the textile industry for employing women revolves around methods of attracting, using, and training them. Our industry is not facing the facts as squarely or adjusting itself as rapidly as others, such as the mechanical trades, are doing.

*Since this meeting, Brown University has announced a course in chemical laboratory techniques, analysis, and testing for about 75 women beginning in January.

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CALENDAR OF COMING EVENTS

Meeting, Rhode Island Section, February 26, 1943.

Meeting, New York Section, Downtown Athletic Club, New York City, March 5, 1943. Program: "Dyeing and Finishing of Rayons"; Speakers: Dr. H. H. Mosher, Onyx Oil & Chemical Co.; Clark Hayden, United Piece Dye Works.

Meeting, Philadelphia Section, March 5, 1943.

Meeting, Northern New England Section, March 19, 1943.

General Business Meeting (in conjunction with New York Section meeting) April 16, 1943, New York City.

Council and Research Committee Meetings, April 17, 1943, New York City.

WATER-RESISTANT FABRIC UTILITY

GEORGE A. SLOWINSKE

Fine Chemicals Division, Technical Laboratory,

E. I. du Pont de Nemours & Co., Inc.

THE New York Section of the A.A.T.C.C. presented at the 1941 Annual Meeting a cooperative paper entitled "Cotton Fabric Constructions in Relation to Water Resistance." The paper was published in full in the January 5, 1942, issue of this journal.[1] The Association's permanent Committee on Water Resistance of Fabrics is studying the problem further. This paper describes additional work which the author, a member of that Committee, is offering for consideration.

This paper by Mr. Slowinske is in reality a continuation of the work done by the A.A.T.C.C. New York Section Paper Committee for 1941, which was presented at the Annual Meeting in Pinehurst, and published in the January 5, 1942, issue of the DYESTUFF REPORTER.

It is Mr. Slowinske's intention to submit this to the A.A.T.C.C. Committee on Water Resistance of Fabrics for their consideration. This subject, however, is of such interest to the textile industry and the war effort at the present time that we are publishing it in advance of such presentation to the Committee.

Mr. Slowinske, who is the co-chairman with Dr. Stiegler on this Committee, will welcome any comments or criticisms from members of the Association.

The New York Section paper presented data showing that porous cotton fabrics which were well treated with a water repellent, as indicated by the A.A.T.C.C. spray and immersion tests, could be evaluated for utility by means of penetration tests. Four such tests (a hydrostatic pressure, an impact penetration, a rubbing penetration, and an air permeability test) were used to evaluate fifty-two treated fabrics. However, only broad general conclusions were given in the paper, and some of the penetration tests were novel and experimental in character. Consequently, this author, who cooperated in that work, made further studies of the problem. A new impact penetration tester, based on the same principle as the original instrument, was developed and standardized. It then was used along with a hydrostatic pressure test and an air permeability test in re-evaluating some of the treated fabrics used in the original study. The author is indebted to the New York Section of the A.A.T.C.C. for the privilege of using the treated fabrics in the supplementary work.

DESCRIPTION OF INSTRUMENTS USED IN WORK

The hydrostatic pressure tester is shown in Figure 1. It was described by this author in a previous paper,[2] and is equivalent to the A.A.T.C.C. tentative standard instrument.[3] The procedure used with it was that described in the A.A.T.C.C. 1941 Year Book.

The air permeability tester is shown in Figure 2. It is a commercial Densometer sold by the maker of the experimental model Permeometer used in the New York Section study. It was selected for use because it was available, and because it has been used for the same purpose by the U. S. Army Quartermaster Depot at Philadelphia. The procedure used with the Densometer was that employed by the Depot.

The new impact penetration tester is shown in Figure 3. Its details of construction are illustrated in the diagrammatic sketches in Figures 4 and 5. It is based on the same principle as the New York Section instrument. It is designed to measure the water which penetrates through a water-resistant[4] fabric subjected to a spray of water. An absorbent blotter is placed against the under side of the fabric to absorb the water. The conditions of test thus simulate those encountered in a rainstorm when a water-resistant jacket is worn over an absorbent or untreated garment. The detailed procedure used was:

A 7 inch by 13 inch cutting of the fabric, with the warp in the long direction, was clamped at one end in the 6 inch spring clamp at the top of the inclined stand. The 6 inch, free clamp, weighing one pound, was clamped to the free end of the fabric. A standard paper blotter, 6 inches by 9.5 inches, was weighed to the nearest 0.1 gram in an air dry condition, and inserted beneath the fabric. The blotting paper was "24 x 38—240 Buff Sterling Blotting" of the Standard Paper Manufacturing Company, Richmond, Virginia, which meets the specifications of that used in the A.A.T.C.C. tentative standard immersion test.[5]

A 500 cc. volume of water at 80±1°F. was poured into the funnel of the tester and allowed to spray on the fabric. At the end of the spraying period (approximately 25-30 seconds), the fabric was lifted and the blotter underneath was removed and quickly reweighed to the nearest 0.1 gram. The increase in weight of the blotter was calculated in grams. An average of 3 determinations, made on representative areas of the fabric, was reported in grams.

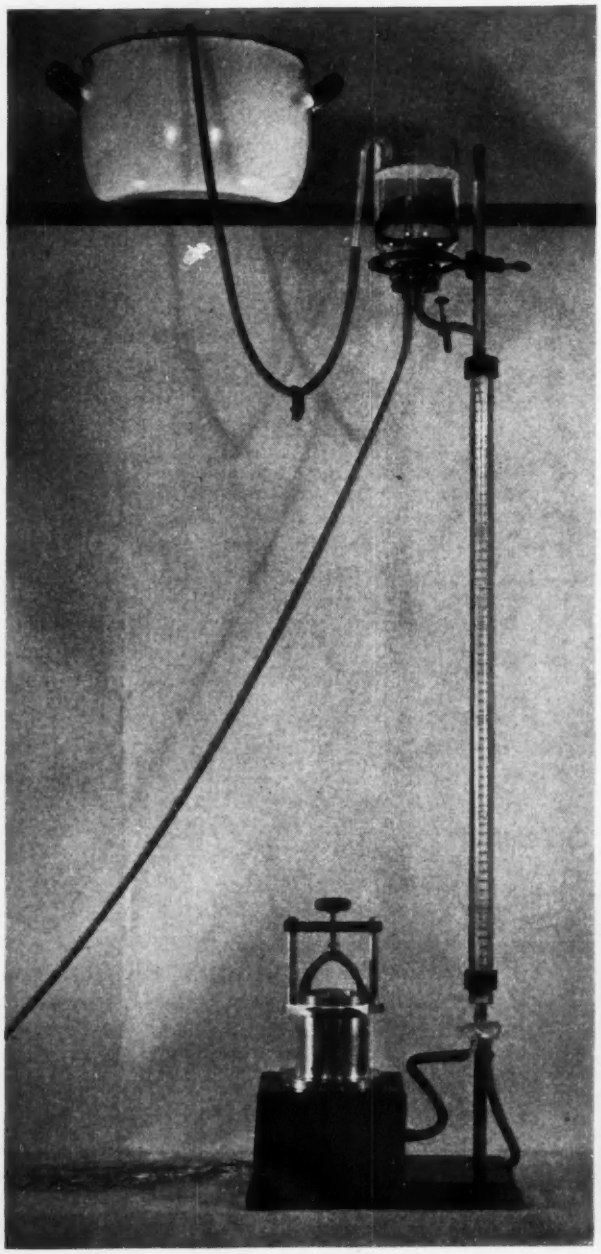

Figure 1—Hydrostatic Pressure Tester—Complete Assembly

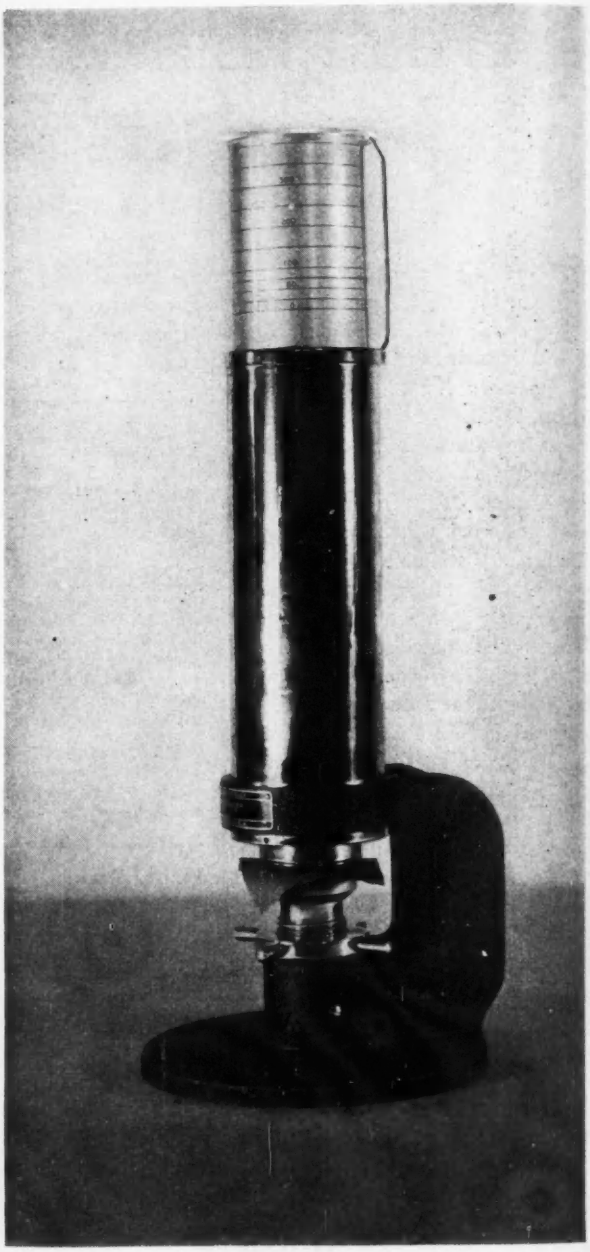

Figure 2—Air Permeability Tester—Commercial Densometer

EXPERIMENTAL DATA

In Table I are given impact penetration, hydrostatic pressure and air permeability data on fifty of the cotton fabrics treated with a commercial durable type water repellent for the original study. They had been secured in the gray from different gray mills and converters and then processed under controlled conditions at a selected finishing plant. This comprised keir boiling, bleaching, mercerizing, vat dyeing and treating with the water repellent. Forty-three of the treated fabrics were reported on in the original paper. Seven (those with code numbers above 52) had not been included in the original paper because of a lack of time to complete the testing work.

In Table II are given hydrostatic pressure data on twelve twill fabrics treated by the author in the laboratory with two commercial water repellents. In the case of each product, the same concentration was applied under the same conditions to all of the fabrics. Therefore, the differences in hydrostatic pressure shown by the different

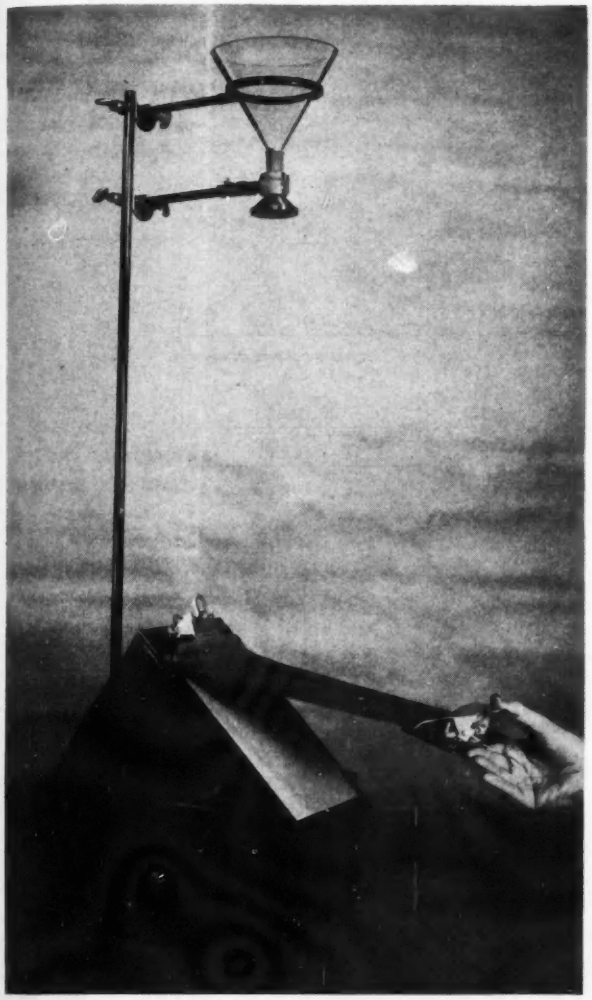

Figure 3—Impact Penetration Tester—Complete Assembly

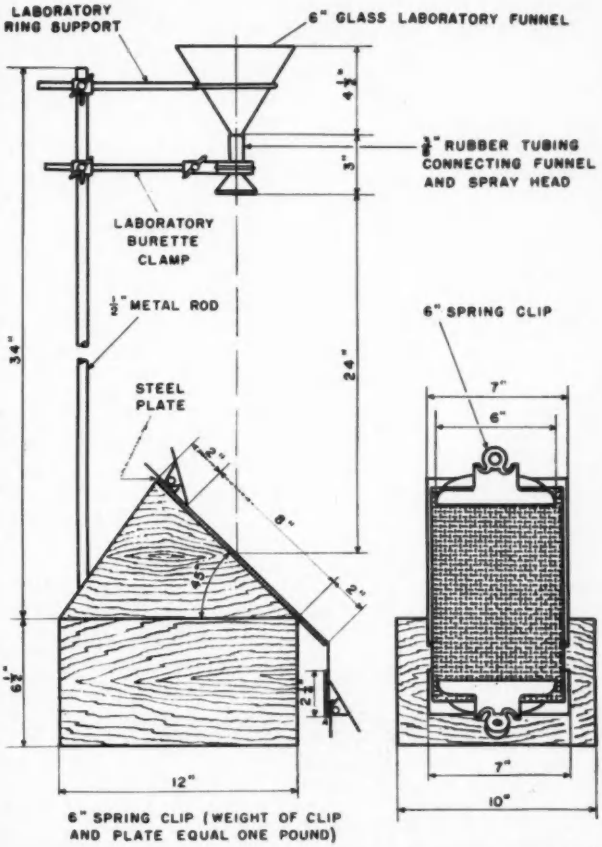

Figure 4—Impact Penetration Tester—Structural Details

fabrics are directly related to their constructional differences.

ANALYSIS OF EXPERIMENTAL DATA

In Table I the treated fabrics are listed in relative order, according to their performances in the two water penetration tests. All of the fabrics had been processed under the same conditions with the same concentration of water repellent. In addition, all of them rated "100" in the A.A.T.C.C. spray test,[2, 6] which is designed to measure the water resistance of fibers and yarns, irrespective of fabric construction. Consequently, it can be assumed that the results obtained in the impact penetration and hydrostatic pressure tests are related to the effects of fabric construction.

A study of Table I will show that there is no real relationship between the air permeability, impact penetration and hydrostatic pressure data for the fifty fabrics of different constructions. This is to be expected, from an analysis of the character of the three tests. Air resistance and water resistance are entirely different properties. Air resistance, for instance, does not involve interfacial tensions between treated fiber and water. In addition, the impact penetration test subjects the fabric to water under dynamic impact, while the hydrostatic pressure test subjects it to water under static pressure. However, the data obtained in the three tests are inter-related for a single weave of fabric. This is shown in Table III for the poplins, twill and broadcloths studied.

The data in Table III show a consistent correlation between air permeability and performance in the impact penetration and hydrostatic pressure tests, for any one weave of fabric. However, the relationship of the test data shown is not strictly mathematical. For instance, a plot of the broadcloth hydrostatic pressure values against the air permeability values will not yield a smooth curve. The reason is that the broadcloths tested differed in such properties as yarn size, twist and ply, as well as in count. All such properties influence both air permeability and water penetration. It is to be expected that a plot of hydrostatic pressure values against air permeability values would produce a smooth curve only when the data were obtained

TABLE I

Impact Penetration, Hydrostatic Pressure and Air Permeability Data on Cotton Fabrics Treated with a Durable Type Water Repellent by a Finishing Mill.

A.A.T.C.C. New York Section Code No. and Weave	*Gray Specifications (Note 1)*	*Average Impact Penetration Gms.*	*Average Hydrostatic Pressure Cms.*	*Average Air Permeability Secs. (Note 2)*
32 Twill	179/103, 2.68, 2/2*	0	66	107
1 Poplin	100/58, 2.54, 2/1*	0	55	112
13 Broadcloth	144/85, 2.70, 2/3*	0	53	86
58 Corduroy	61/156, 1.51, 1/1	0.1	43	60
2 Poplin	102/64, 2.44, 2/1*	0.1	42	85
4 Poplin	102/64, 2.83, 2/1*	0.1	42	67
5 Poplin	144/70, 3.13, 2/2*	0.1	39	57
33 Twill	104/56, 1.92, 2/2*	0.1	38	60
38 Twill	114/70, 2.59, 1/1	0.1	37	33
56 Corduroy	43/136, 2.22, 1/1	0.1	36	26
61 Duck	52/46, 1.50, 2/2	0.1	35	94
28 Gabardine	110/78, 2.03, 1/1*	0.2	33	22
57 Corduroy	60/150, 2.46, 1/1*	0.3	30	23
31 Herringbone Twill	66/48, 1.76, 1/1	0.1	27	32
36 Twill	124/62, 2.29, 2/1*	0.7	31	26
43 Warp Sateen	120/60, 2.51, 1/1	0.7	31	18
46 Flannel	49/41, 3.26, 1/1	0.1	26	11
27 Gabardine	128/74, 2.09, 2/1	0.8	35	20
14 Broadcloth	144/78, 2.95, 1/1*	1	41	44
47 Flannel	50/40, 3.17, 1/1	0.1	24	8
11 Plain Cloth	158/140, 6.00, 1/1*	5	41	29
15 Broadcloth	147/74, 4.24, 2/2*	6	40	23
12 Plain Cloth	142/154, 6.10, 1/1*	9	49	29
16 Broadcloth	140/80, 3,67, 1/1*	7	36	25
17 Broadcloth	142/78, 3.94, 1/1*	7	31	18
6 Poplin	100/51, 3.42, 2/1*	4	29	19
26 Gabardine	124/72, 1.89, 2/1*	3	27	17
18 Broadcloth	150/76, 3.48, 1/1*	7	26	18
29 Gabardine	109/75, 2.29, 1/1	4	24	17
60 Warp Sateen—napped back	96/60, 2.33, 1/1	10	24	9
8 Poplin	108/48, 3.63, 2/1*	6	22	15
44 Warp Sateen	116/60, 2.60, 1/1	10+	27	11
20 Broadcloth	136/64, 4.15, 1/1	10+	22	10
19 Broadcloth	136/60, 4.08, 1/1*	10+	22	9
21 Broadcloth	112/60, 3.64, 1/1	10+	21	8
45 Warp Sateen	104/56, 3.02, 1/1	10+	21	7
41 Twill	96/64, 3.07, 1/1	10+	20	9
48 Sheeting	64/68, 3.46, 1/1	10+	20	7
40 Twill	88/44, 2.13, 1/1	10+	19	8
55 Pique—sueded face	140/88, 3.57, 1/1	10+	18	7
22 Broadcloth	99/60, 4.34, 1/1	10+	18	5
54 Pique	140/88, 3.57, 1/1	10+	17	7
23 Print Cloth	80/80, 4.66, 1/1	10+	17	4
42 Twill	102/60, 4.41, 1/1	10+	16	4
50 Sheeting	56/60, 4.25, 1/1	10+	13	4
10 Poplin	98/44, 4.36, 1/1	10+	13	3
24 Print Cloth	80/62, 5.23, 1/1	10+	13	2
49 Sheeting	48/48, 3.25, 1/1	10+	12	4
25 Print Cloth	64/60, 5.72, 1/1	10+	10	2
52 Sheeting	32/28, 4.18, 1/1	10+	5	2

Note 1

First item (e.g., 179/103)—Gray warp and filling count.
Second item (e.g., 2.68)—Gray weight in yds./lb. of 36" width.
Third item (e.g., 2/2*)—Warp and filling yarn ply (combed when followed by * sign).

Note 2

The values were obtained with the Densometer shown in Figure 2, which measured the time required to force 300 cc. of air through a 0.1 square inch area of the fabric, under a total pressure of 5 ounces.

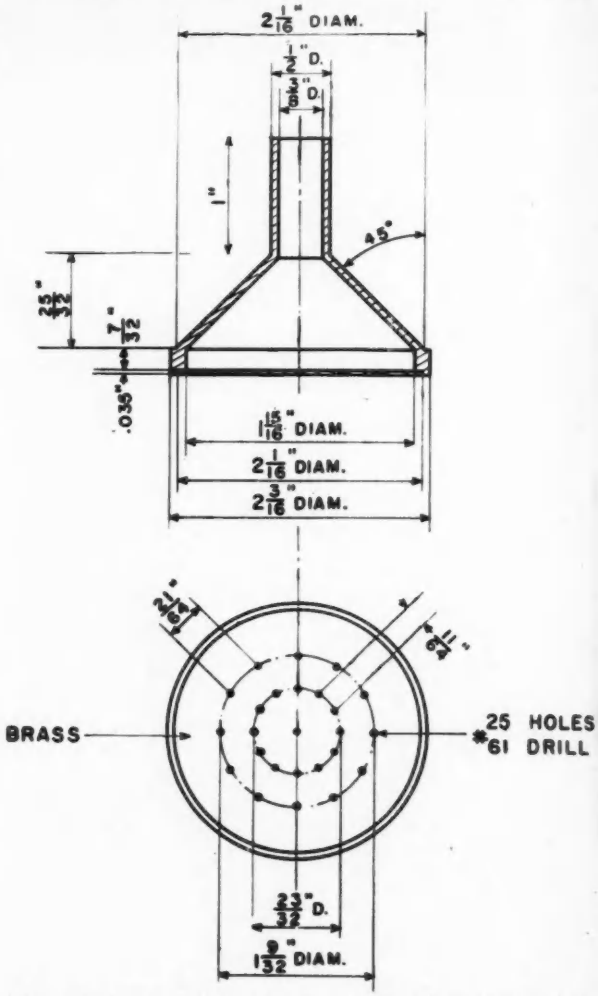

Figure 5—Impact Penetration Tester—Details of Spray Head or Nozzle

TABLE II

Hydrostatic Pressure Data on Cotton Fabrics Treated in the Laboratory with Two Different Water Repellents.

Fabric	*Average Hydrostatic Pressure—Cms.* *Product I*	*Product II*
Twill A	44	43
Twill B	39	40
Twill C	37	34
Twill D	35	33
Twill E	34	33
Twill F	31	31
Twill G	30	28
Twill H	26	25
Twill I	24	20
Twill J	22	19
Twill K	19	21
Twill L	18	17

on a series of treated fabrics of identical weave which differed in only one property, such as yarn size or count.

The data in Table III also show that when any one weave of fabric is considered, it is possible to predict the relative performance of a water-resistant fabric, even before it is treated. This is because the application of

TABLE III

Impact Penetration, Hydrostatic Pressure and Air Permeability Data for Treated Fabrics of the Same Weave (Data from Table I).

A.A.T.C.C. New York Section Code No.	*Gray Specifications*	*Average Impact Penetration Gms.*	*Average Hydrostatic Pressure Cms.*	*Average Air Permeability Secs.*
Poplins				
1	100/58, 2.54, 2/1*	0	55	112
2	102/64, 2.44, 2/1*	0.1	42	85
4	102/64, 2.83, 2/1*	0.1	42	67
5	144/70, 3.13, 2/2*	0.1	39	57
6	100/51, 3.42, 2/1*	4	29	19
8	104/48, 3.63, 2/1*	6	22	15
10	98/44, 4.36, 1/1	10+	13	3
Twills				
32	179/103, 2.68, 2/2*	0	65	107
33	104/56, 1.92, 2/2*	0.1	38	60
38	114/70, 2.59, 1/1	0.1	37	33
36	124/62, 2.29, 2/1*	0.7	31	26
41	96/64, 3.07, 1/1	10+	20	9
40	88/44, 2.13, 1/1	10+	19	8
42	102/60, 4.41, 1/1	10+	16	4
Broadcloths				
13	144/85, 2.70, 2/3*	0	53	86
14	144/78, 2.95, 1/1*	1	41	44
15	142/74, 4.24, 2/2*	6	40	23
16	140/80, 3,67, 1/1*	7	36	25
17	142/78, 3.94, 1/1*	7	31	18
18	150/76, 3.48, 1/1*	7	26	18
20	136/64, 4.15, 1/1	10+	22	10
19	136/60, 4.08, 1/1*	10+	22	9
21	112/60, 3.64, 1/1	10+	21	8
22	99/60, 4.34, 1/1	10+	18	5

practically all commercial water repellents does not change the air permeability to any appreciable degree, since they do not coat or fill the fabrics. This point was first shown by the data presented in the New York Section paper. However, such a prediction method based on untreated fabric air permeability values is of no merit whatever unless the particular fabric weave is taken into consideration. As pointed out previously, no correlation exists between air permeability and water penetration among fabrics of different weave. This is illustrated in Table IV.

In the first pairing in Table IV the corduroy and duck have the same impact penetration value, approximately the same hydrostatic pressure value, and markedly different air permeabilities. In the next pairing the broadcloth and flannel have markedly different impact penetration values, but are identical in air permeability. In the third pairing the plain cloth has a poor impact penetration value and a good hydrostatic pressure value, while with the herringbone twill it is just the reverse.

The hydrostatic pressure data on the laboratory treated twills in Table II demonstrate that the relative ratings of a series of treated fabrics in a water penetration test is not dependent on the water repellent used. In the table, the fabrics are listed in order according to their hydrostatic pressure test performances after treatment with Product I. It will be seen that the relative order of performance is the same after treatment with Product II, with only one exception (believed to have been caused by a variation in sampling, treating or testing). This means,

TABLE IV

Impact Penetration, Hydrostatic Pressure and Air Permeability Data for Treated Fabrics of Different Weave (Data from Table I)

A.A.T.C.C. New York Section Code No. & Weave	*Average Impact Penetration Gms.*	*Average Hydrostatic Pressure Cms.*	*Average Air Permeability Secs.*
56 Corduroy	0.1	36	26
61 Duck	0.1	35	94
21 Broadcloth	10+	21	8
47 Flannel	0.1	24	8
12 Plain Cloth	9	49	29
31 Herringbone Twill	0.1	27	32

for example, that Twill A would be the best of the twelve twill fabrics in hydrostatic pressure performance, no matter what repellent were used. Other work not reported here showed that the same relationship holds for fabrics of different weaves treated with different water repellents. This makes it possible to choose a fabric for use in, for example, a raincoat, without first deciding what water repellent will be specified. Then after the fabric is chosen and commercial treatment is started by a finishing mill, the quality of the finish can be controlled by means of the spray and immersion tests, which evaluate the finish and not the fabric.

CONCLUSIONS AND GENERAL OBSERVATIONS

The experimental data in Table I, and the different arrangements of the data shown in Tables III and IV, demonstrate strikingly that fiber or fabric wetting tests like the A.A.T.C.C. tentative standard spray and immersion tests should be combined with fabric penetration tests like the A.A.T.C.C. tentative standard hydrostatic pressure test and the impact penetration test described in this paper, in order to obtain a complete over-all picture of a water-resistant fabric. An air permeability test also must be run if the fabric is intended for use as a combination wind-resistant and water-resistant textile. This conviction that no single test will satisfy all requirements is not new. It has been discussed previously by numerous workers in the field, such as Scott[7], and Klingelhofer, Mendrzyk and Sommer.[8]

The spray and immersion tests are valuable tools when used for the purpose for which they were designed, the control and evaluation of water-repellent treatments on fabrics. However, the mere fact that a fabric is well treated with a satisfactory water repellent does not mean that it will keep out rain. A satisfactorily treated 48/48 sheeting will possess fibers and yarns which will resist wetting, as measured by means of the spray and immersion tests, but such a fabric will have very low resistance to the passage of water through it.

It is sometimes forgotten that two classes of water-resisting fabrics are used today; waterproof fabrics and water-resistant or repellent fabrics, which form the sub-

ject of the present study. Both classes of water-resisting fabrics possess advantages and disadvantages which are beyond the scope of this paper. A waterproof fabric[4] is coated or closed up to form a continuous wall against the passage of water. A water-resistant fabric[4] possesses pores and resists the passage of water by the smallness and shape of the pores, the thickness of the fabric, and the resistance to wetting of the fibers and yarns. As early as 1924 Pearson[10] stated the same thing as follows:

> "Similarly the resistance to penetration of a water-resistant rain coating, for instance, depends on: (1) The thickness of the fabric, i.e., the length of the pores or holes in the fabric. (2) The diameter of the pores or holes. (3) The pressure of the water to which the fabric is subjected. (4) The efficacy of the treatment given to the fabric."

These apparently obvious performance characteristics of a water-resistant fabric were not too well appreciated. Consequently, the original New York Section paper served an extremely valuable purpose in clearing up confusion which had existed in the trade. In addition, the paper presented experimental data and introduced tools which could be used in further studies of water-resistant fabric construction. The work presented in this paper is intended to supplement the original study.

It is believed that essentially three properties should be considered in evaluating or predicting the performance of a water resistant fabric intended for use in garments subjected to outdoor wear. They are:

1. Resistance to wetting of the fibers and yarns.
2. Resistance to the passage of water under static pressure.
3. Resistance to the passage of water under impact or dynamic pressure.

A fourth property, resistance to the passage of air, should also be considered if the fabric is intended for use in a wind-resistant garment.

The A.A.T.C.C. spray and immersion tests are well suited for evaluating the first property of fiber water resistance. They give results which are directly related to interfacial tensions between treated fiber and water, although it is admitted that both could be modified, improved or refined[2, 9]. In this connection, a big advantage of the spray test is its simplicity. Since the instrument is easy to construct and gives a result in about a minute, it is widely used in the trade (over 300 spray tester instruments have been made in the last four years). Impact or static pressure tests involving passage of water through the fabric are sometimes considered for use in place of either the spray or immersion tests. Such tests are not well suited for the purpose. For instance, if two lots of finished fabric vary in spray test rating by 10 points, it is obvious that a difference in efficiency of water-repellent treatment exists. But a hydrostatic pressure test difference of 10 cms. may be due to a slight difference in count, or mechanical treatment during finishing. Pinhole leakage is not a measure of fiber and yarn water resistance.

The second property, resistance to water passage under static pressure, can be measured with the A.A.T.C.C. hydrostatic pressure instrument. In this connection, it would be advantageous to have the A.A.T.C.C., the A.S.T.M. and the various Federal agencies, probably working through the National Bureau of Standards, adopt a uniform hydrostatic testing procedure. Probably the two most complete and comprehensive studies of hydrostatic pressure testing procedures are those of the British Government "Department of Scientific and Industrial Research" and the "German Materials Testing Houses." The former work was published in 1930[11]. The latter work was published in 1940[8]. The two publications recommend tests based on the same principle as the A.A.T.C.C. test and the A.S.T.M. Procedure B[12], which subject the fabric to a rising column of water and determine the pressure required to start leakage. In the A.S.T.M. Procedure B, the head is increased at a rate of 2 centimeters per minute for the first 10 centimeters, and at a rate of 10 centimeters per minute thereafter. In the A.A.T.C.C. test a uniform rate of 60 centimeters per minute is used. The advantage of the changing rate in the A.S.T.M. test is rather doubtful. On the other hand, the rate of increase of head in the A.A.T.C.C. test may be unduly high.

The third property of resistance to water passage under dynamic pressure can be measured with the impact penetration instrument described in this paper. It should be stressed, however, that the impact penetration instrument in its present form does not yield strictly quantitative data. It is not, for instance, as accurate a test instrument as the A.A.T.C.C. hydrostatic pressure tester. However, it is believed that the results obtained with it are more directly related to the passage of water under rain impact.

The fourth property of resistance to air passage can be measured with an instrument like the Densometer used in the present work, or a similar air permeability tester. It is admitted that the Densometer itself may not be the best available instrument for the purpose, although the subject of air permeability test methods is beyond the scope of this paper.

It is believed that the hydrostatic pressure test and the impact penetration test could be used together to grade water-resistant fabrics intended for use in rain wear. A classification, such as the following, might be considered:

	Impact Penetration Test Value—Gms.	*Hydrostatic Pressure Test Reading—Cms.*
Class I (very good) ..	0	50 and over
Class II (good)	0 to 0.1	35 to 50
Class III (fair)	0.1 to 1	20 to 35
Class IV (poor)	1 to 10	20 to 35
Class V (very poor)..	10 and over	20 and under

The adoption of such a grading system for treated fabrics intended for use in such garments as water-resistant raincoats, golf jackets and ski jackets would be of

help to all concerned. It would help to stop the practice of calling a golf jacket made from a single thickness of low-count poplin rain resistant simply because it was treated with a water repellent. It would help to segregate the wide variety of fabrics and garments which today are treated with water repellents. A water-resistant ladies' rayon dress fabric and a water-resistant Army cotton poplin are alike in that they both possess fibers and yarns which resist staining and wetting by water and water-borne soils. But they are entirely different in the main function they are intended to perform. The treated dress fabric is intended to resist water or stain adsorption only, while the treated poplin is intended to protect the wearer underneath by preventing the passage of water. In other words, the production of a satisfactory water-resistant fabric for use in rain wear requires that a satisfactory water repellent be applied to a fabric of suitable construction.

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MEETING, PHILADELPHIA SECTION

A MEETING of the Philadelphia Section was held at the Hotel Philadelphian on January 22, 1943. There were 124 present at this meeting.

George D. Mansfield, member of the Philadelphia Council, was introduced by James P. Conaway. Mr. Mansfield gave a talk on the twenty-five thousand dollar appropriation as made by the City of Philadelphia to the Philadelphia Textile School. This presentation was acknowledged by M. Earl Heard, Dean of the Philadelphia Textile School, who made a few remarks.

Major H. C. Cooper, of the U. S. Marine Corps, was the speaker of the evening, and was introduced by Walter F. Fancourt, 3rd. His subject was, "Camouflage Printing to be used for the Armed Forces." Major Cooper, who has seen service in the Solomon Islands, gave a few interesting descriptions regarding the need of perfect camouflage. He pointed out that so far, the most perfect material which had given the best camouflage effect was on bobinette or trico cotton material, this giving a drape effect, tending to break up the outline, especially when blotch printed.

After Major Cooper's talk, Colonel Frank M. Steadman of the U. S. Quartermaster's Corps was called on to give a few comments regarding camouflage work pertaining strictly to the Army.

Respectfully submitted,

BOYCE C. BOND, *Secretary.*

ONE HUNDRED AND FORTIETH COUNCIL MEETING

THE Council held its 140th meeting at the Engineers' Club in Boston on Saturday, January 16, 1943. Present were President Thomas R. Smith presiding; Roland E. Derby and Charles A. Seibert, Vice Presidents; William R. Moorhouse, Treasurer; Louis A. Olney, Chairman of the Research Committee; William H. Cady, Carl Z. Draves and P. J. Wood, Past Presidents; John N. Dalton, Harry M. Hartnett and Dexter R. Kneeland representing Northern New England; Allison R. Fletcher and Ben Verity representing Rhode Island; Kenneth H. Barnard, J. Robert Bonnar, J. Ernest Meili, and George A. Moran representing New York; A. Henry Gaede representing Piedmont; Jack Anderson representing South Central; Bertil A. Ryberg, Associate Research Director; and Harold C. Chapin, Secretary. A tellers' report was accepted, declaring the Presidents and two Vice Presidents re-elected. The Secretary's report of the 139th Council meeting and financial report of January 12, and the Treasurer's report of January 15 were accepted.

It was voted that there be another Intersectional Contest in 1943, at time and place to be decided by the Council on advice from the New York Section. Kenneth H. Barnard was again appointed Chairman of the Contest Committee. It was voted that the judges render their decision at time to be specified by the Chairman of the Contest Committee, not necessarily, as heretofore, on the date of the contest; and that they rate scientific value, practical value and originality 30% each; presentation 10%.

William H. Cady, reporting for the Committee on Rebates to Sections, offered a proposed amendment to the By-Laws for letter ballot of the Council. It was voted that a General Business Meeting of the Association be held in connection with the New York Section meeting of April 16, and that a meeting of the Council be held in New York on the following day.

Parker Wilder & Co., the Silk & Rayon Printers & Dyers Association of America, and Talbot Mills were elected to Corporate membership. Each of the following was elected to the class of membership specified, as of thirty days from publication of application, provided no objecton be received meanwhile by the Secretary.

SECRETARY'S FINANCIAL REPORT—JANUARY 12, 1943

	Applications	*Dues, Regular and Reinstate.*	*Corporate and Sustaining*	*Miscellaneous*	*Totals*
Received and transmitted to Treasurer, August 1 to October 1, 1942	$147.50	$26.25	.....	$146.88	$320.63
October 1, 1942 to January 12, 1943	460.00	10,188.00	5,260.00	378.34*	16,286.34
Total for fiscal year to date	607.50	10,214.25	5,260.00	525.22	16,606.97
Leaving deposited by Treasurer with Secretary					500.00

Miscellaneous Items*

Dyed standards	$36.50	Standard gray cards	6.00
Crock cloth	33.98	Launderometer royalties	95.00
Water test apparatus	43.00		$390.28
Year Books	157.50	Bank charges	—11.94
Reporters	7.80		$378.34
Buttons	10.50		

Senior

P. Arkin	O. B. Graichen	R. Ottenheimer
J. F. Ash	N. R. Guthrie	A. Politzer
F. M. Barnes	W. H. Harriss	H. M. Pontefract
O. L. Bennett	R. Harwood	J. R. Rafter
A. D. Bolton	O. J. Haufe	K. L. Ralph
E. Bostwick	C. J. Henault, Jr.	T. Sanderson
J. E. Briggs	H. C. Hennig	H. Sankey
J. Buchert	D. A. Heslin	C. E. Signor
R. Burns	J. R. Hester	M. Silverman
M. O. Castro	W. L. Jaeger	F. L. Simon
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J. J. Connorton	J. M. Kuhn	S. A. Sokoloff
A. Corry	A. J. Lombard	L. A. Stanley
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D. B. Ekstrom, Jr.	J. Moore	R. D. Walker
H. W. Epler	J. F. Munroe	W. H. Wisdom
H. F. Fischer	D. M. Musser	G. G. Wunsch
G. K. Gardner	T. O. Ott, Jr.	

Junior

E. E. Allen	R. B. Fickinger	H. D. Pelan
W. D. Cuthbertson	C. Gardner	R. R. Pitt
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Student

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R. L. Beard	A. L. Fried	P. M. Platzman
W. L. Benson	J. K. Ginburg	H. G. Popkin
W. M. Bonner	R. C. Griffin, Jr.	L. R. Rochefort
H. E. Brooks	J. S. Haynesworth	H. Sederholm
V. L. Cathey	H. J. Krantz, Jr.	W. G. Silva
R. L. Dufour	C. R. Kuhn	E. R. Stall, Jr.
O. P. Ensign, Jr.	A. W. Margolis	M. K. Steinberg

Transferred from other classifications to Senior membership were E. R. Kaswell, as of March 21; F. T. Simon, as of May 9; K. S. Campbell, K. R. Fox and E. J. Levine.

Respectfully submitted,

HAROLD C. CHAPIN, *Secretary.*

MEETING, RHODE ISLAND SECTION

THE January meeting of the Rhode Island Section was held on the 22nd at the hall of the Providence Engineering Society with an attendance of seventy-five.

A colored motion picture was shown through the courtesy of the E. I. du Pont de Nemours & Co., Inc. It was entitled "Salvaging Light for Victory" and showed how the proper use of paint and the careful selection of colors not only "save" light but increases both safety and efficiency.

The speaker for the evening was George O. Linberg, E. I. du Pont de Nemours & Co., Inc., and the subject was "Continuous Indigo Dyeing on Woolen Piece Goods." The paper was well presented and was very interesting not only as an example of a successful effort to dye goods for the Navy, but as an example of the problems, chemical and mechanical, that had to be considered and solved before the runs became a routine daily matter.

A number of questions indicated that the process has importance and interest even outside the woolen field.

The meeting came to a close at about 10:30 P.M.

Respectfully submitted,

ROBERT W. JOERGER, *Secretary.*

MEMBERSHIP

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VOLUME 32 FEBRUARY 15, 1943 NUMBER 4

Sustaining Memberships

THERE are 20 sustaining members listed in the 1942 Year Book of the American Association of Textile Chemists and Colorists. In the same book the total membership listed is 3,082. In the 1941 Year Book there are listed 24 sustaining members out of a total of 2,814 and in the 1940 Year Book there are listed 27 out of a total of 2,607. Thus, while the membership as a whole has been increasing in the past three years the number of sustaining memberships has been decreasing. Expressed as a percentage of the total membership, the figures representing sustaining memberships would be as follows: 1942—.65 per cent; 1941—.89 per cent; 1940—1.04 per cent. If we took 1940 as a base year, giving the sustaining memberships a par value of 100, the *decrease* would approximate the following pattern: 1940—100; 1941—87; 1942—63.

As far as corporate memberships are concerned for the same years, the following number were listed in the year books: 1940—33; 1941—41; 1942—79. Expressed as percentages of total membership, we would have the following figures; 1940—1.30 per cent; 1941—1.46 per cent; 1942—2.23 per cent. If we again take 1940 as a base year, giving the corporate memberships a par value of 100, the *increase* would approximate the following pattern: 1940—100; 1941—105; 1942—172.

If we now take 1940 again as a base year, giving the total membership a par value of 100, the *increase* would approximate the following pattern: 1940—100; 1941—107; 1942—118.

While the total membership list has exhibited a steady growth, and the corporate membership list has done the same (with a special spurt in 1942), we find that the sustaining membership list has shown just as steady a decrease. It is interesting to note that sixteen of the sustaining members listed in 1940 were still listed in 1942, thus indicating that only 4 *new* names had been added to the list.

In discussing the subject of sustaining memberships with many members of the association it was apparent that many of them believed that there were certain restrictions regarding sustaining membership that would disqualify them. Other members have indicated that they would be willing to become sustaining members but the thought had never occurred to them and that if they had been approached they would have been willing to make the necessary contribution. To clarify the circumstances under which a member may become a sustaining member we will quote from the association's by-laws, article II, section 3:

"Any Senior, Junior or Associate member who supports the activities of the Association in any year by the payment of at least $10.00 in addition to the regular dues shall be designated a Sustaining member."

It should not be necessary to elaborate on what the association has done or why it is deserving of support, to those who are already members, but just as a reminder we will quote from the report of the research committee as published in the 1942 Year Book:

"The primary effort of the Research Committee during the past year has been to cooperate with various Governmental and civilian organizations in the interests of the defense and war programs.

"Prominent in this respect has been the organization of the Committee Cooperating with the Government on Uniform Fabrics; the Committee on the Aging of Sulfur Dyed Textiles; and the Committee on Mildewproofing of Textile Fabrics. Many other committees have also cooperated with the Government, notable among which are those on Fastness to Washing; Fastness to Light; Fastness to Perspiration; Fastness to Gas Fading; Fastness to Chlorine; Water Repellency; Testing Fire Resistant Materials; and Fastness to Dry Cleaning. . . .

"In the appointment of new committees, as well as the reorganization of some of the older committees, an effort has been made to include those who are best suited to cooperate in our war effort. . . ."

The active work of the research committee is carried on largely through the 38 sub-committees. To continue the support of the work carried out by and under the direction of the research committee requires a considerable sum of money now obtained largely by the payment of dues by junior, senior, associate, corporate and sustaining members.

The work of the committee could be considerably amplified by an increase in the number of sustaining members. If *only* 10 *per cent* of the membership would pay the *minimum amount* necessary to become sustaining members, it would increase the funds of the association by approximately $3,000 per year!

TRADE NOTES • NEW PRODUCTS

OBITUARY

CESARE PROTTO

CESARE PROTTO, Assistant General Manager of the Organic Chemicals Department of E. I. du Pont de Nemours & Company, died at the Delaware Hospital, Wilmington, Delaware, on January 22 after an illness of several months.

Cesare Protto

Mr. Protto, an outstanding authority on the application of dyes, was born in Biella, Italy, on October 5, 1884, the son of Sebastiano and Bianca Protto. He was educated in Italy and England, majoring in chemistry, textiles, dyeing and printing, and graduated with high honors.

He early became associated with the Badische Aniline and Sodafabrik of Germany. After a year's service there, he was associated with Badische Company, Ltd., in Manchester, England, and then came to its offices in New York City in 1908 as a dye specialist, continuing in that capacity until 1917 when he entered the service of the du Pont Company. He was assistant to the Director of Sales of the Dyestuffs Department, and later a Director of Sales of that department until September, 1929, when he became the Assistant General Manager of the Organic Chemicals Department, which position he held at the time of his death.

Mr. Protto was a charter member of the American Association of Textile Chemists and Colorists and at the time of his death was a member of the Philadelphia Section. He was also a member of several other technical associations, the Wilmington Country Club and the Lotus Club of New York. He resided at 900 Du Pont Road in Westover Hills. He is survived by his widow and one son, Cesare A. Protto; also his mother, a sister, and a brother residing in Italy.

• VISCOSE TRANSFERS

Frank Chateauneuf, for the past two years connected with the Providence, R. I., sales office of the American Viscose Corporation, has been transferred to the company's Sales Development at Marcus Hook, Pa. Everton H. Loveless of the company's Standards Department at Marcus Hook has been transferred to Providence to take over the work formerly done by Mr. Chateauneuf.

• COLUMBIA TEXTILE COURSES

Six courses in textile subjects opened on February 1st in the Extension Division of Columbia University. There are courses in Cotton Goods Converting; Rayon and Spun Rayon Goods Converting; Woolen and Worsted Manufacture; Identification, Analysis & Testing of Textiles; Textile Design; and a course in Textile Chemistry.

Registration of students began on January 28th and classes in Cotton Goods Converting and Woolen and Worsted Cloth Manufacturing began on February 1st at 7:30 P. M. All courses consist of 15 lectures given once a week and ending in May. Information about these courses can be obtained from the Extension Division, Columbia University, 116th Street and Broadway, New York.

• METANOL

Metanol is a new compound used for mold - mildew - and - rot - proofing. It is applicable to both burlap and osnaburg. Formula for latter is said to contain proper coloring matter conforming to Government specifications for fastness and shade. There are no solvent hazards. It is stated that it is non-poisonous and non-inflammable. It is claimed to be effective under all climatic conditions—including that of the tropics. Metanol can be used for any type of vegetable fiber fabric such as cotton, linen, jute, hemp, sisal and paper. It is manufactured by The Hart Products Corp., of 1440 Broadway, New York City.

• BULLETIN ON WATER RESISTANCE

A new technical bulletin, "Increasing Water Resistance of Polyvinyl Alcohol Coatings," has been issued by the Electrochemicals Department of E. I. du Pont de Nemours & Company, manufacturer of this plastic which is said to be gas- and vapor-proof, and resistant to grease and most organic solvents.

Methods are described for reducing the water sensitivity of the polyvinyl alcohol coatings after they have been deposited from water solution through the use of water-soluble thermosetting resins, drying oils, and certain chromium compounds.

For example, films or coatings of polyvinyl alcohol which have been dipped in a drying oil and then dried, preferably at elevated temperature, show a substantial increase in water resistance. Linseed oil, chinawood oil, oiticica oil, dehydrated castor oil, and certain synthetic drying oils have been found useful, but the rate of reaction and uniformity of the coating vary considerably with the different oils. The best results have been obtained with chinawood, oiticica, and linseed oils, the former two requiring only about one hour to dry at 105°C., linseed oil requiring five hours or more.

Drying can be accelerated by the addition of 0.1 per cent to 1 per cent of a cobalt drier, but careful regulation of the amount and the drying conditions is required to avoid "orange peel" effects. If preferred, the drying oils can be added directly to the polyvinyl alcohol solution from which the coating or film is applied. The increased water resistance is apparently not merely a surface effect, since unusual swelling does not occur at the freshly cut edges of the film. Moreover, samples coated with boiled linseed oil, for example, retain their water resistance even after immersion in paint solvents, such as a mixture of acetone, methanol, and benzene.

Copies of the bulletin may be secured by writing to the Electrochemicals Department, E. I. du Pont de Nemours & Company, Wilmington, Delaware.

• "E" AWARD TO CALCO

On Wednesday, January 20, workers and management of the Calco Chemical Division, American Cyanamid Company at Bound Brook received the Army-Navy "E" Award for excellence in war production from General Alden H. Waitt, Chemical Warfare Service, Army of United States, and insignia pins for every employee from Commander Herman J. McCarthy, United States Navy, in a colorful ceremony which was broadcast throughout the metropolitan area over Radio Station WJZ.

The presentation, which was held in one of the plant buildings, featured speeches by General Waitt and Commander McCarthy and an address of acceptance by F. M. Fargo, Jr., General Manager, and Frank J. Pucci, President of the Chemical Workers Union Local. Paul Robeson, famous Negro baritone, opened the ceremonies with the song, "America," and concluded them with his rendition of the national anthem in which the audience of more than 4,000 joined.

Telling the audience that "this is your war every bit as much as it is the war of

AT THE CALCO CEREMONIES

ABOVE—Left to right: F. M. Fargo, Jr., General Manager at Calco; General Alden H. Waitt; Commander Herman J. McCarthy; and Frank J. Pucci.

RIGHT—A small section of the employees' audience.

the soldiers at the front," General Waitt indicated the vast importance in the war effort of the place held by workers in the chemical industry. "Without them," he said, "many lives would be lost through lack of proper medication. Without them, essential camouflage, based upon fast-to-light dyestuffs, would be impossible. Without them, rubber in its myriad forms would harden and crack and be all but useless to the United Nations' war machine."

He was preceded by Representative Charles A. Eaton of New Jersey, who made an appeal for "more and more" production.

In his address of acceptance, Mr. Fargo told his listeners that although they had every reason to feel proud of the outstanding production record for the preceding year even greater efforts would be required of them in the year to come. He indicated the fact that the War and Navy Departments are calling upon the Chemical Industry for an ever-increasing volume of heavy and intermediate chemicals, and promised on the behalf of the Calco personnel that no effort would be spared to meet and even exceed the responsibilities thus imposed on the organization.

Navy "E" insignia pins were presented in person to 18 old employees by Commander McCarthy and provision was made for an insignia pin and certificate for every employee. The ceremonies were presided over by E. J. Dempsey, Works Manager at Calco.

● RESEARCH ASSOCIATE, T.C.C.A.

In order to further to a far greater degree the movement of accurate color identification in industry and the linking of science and commerce by a comprehensive method of color specification, The Textile Color Card Association has now established a Research Associate at the National Bureau of Standards in Washington and through the co-operation of the Bureau, Mrs. Genevieve Reimann has been appointed by the Association to conduct this research under the supervision of Dr. Deane B. Judd, Physicist at the Bureau of Standards.

In outlining the scope of this far-reaching program of color identification and standardization, it was stated that the project would include the calibration of the 216 colors contained in the Ninth Edition of the Standard Color Card of America and the translation of these standards into the language of scientific equivalents and nomenclature. The spectrophotometric curves of each of the standard colors will be measured by the Recording Spectrophotometer. Then will follow the location of the colors in the Inter-Society Color Council-National Bureau of Standards System and the assignment of their corresponding designations, and the visual comparison of the 216 colors with Munsell Standards and the assignment of Munsell notations to these colors.

The Association believes that the compilation of this valuable color data will provide a most authoritative and complete guide, not only for all the color-using industries, but also for the Quartermaster General's Office and its various Depots, the Navy Department and other branches of our Government. As the War Department has adopted the spectrophotometer for measuring its colors and as this and other Departments of the Government also make wide use of the Association's Ninth Edition Standard Card, the co-ordination of these accurate color specifications will be most valuable for war requirements. When this entire data has been assembled, it will be printed in booklet form and placed at the disposal of the Government and industry and will be a supplement to the Ninth Edition Standard Card.

In emphasizing the broad scope of the Association's color standardization program, it was stated that work on this plan had progressed for nearly two years, but that it could not be put into effect until certain details incidental to the compiling of the Standard Ninth Edition Card were completed. This color specification data will supplement and tie into the work of the American Standards Association and the Inter-Society Color Council, The Textile Color Card Association being a member of both these groups.

It was stated that Mrs. Reimann, an alumna of the Maryland Institute of Art and Johns Hopkins University, and also associated with the Research Laboratory

and the Munsell Foundation, was especially well qualified to carry on this important color research work with the care and precision it demanded. She has served previously as Research Associate at the National Bureau of Standards for several nationally known organizations.

● "E" AWARD TO ROHM & HAAS

The Bristol, Pa. plant of Rohm & Haas Company, whose research laboratories perfected the highly-transparent plastic used for turrets, cockpit-covers and noses of U. S. warplanes, on January 29th received the joint Army-Navy "E" Pennant for its excellent production record. The presentation rally, at which Dr. Thomas S. Gates, President of the University of Pennsylvania, acted as Master of Ceremonies, included a presentation of the "E" pennant by Brig. Gen. F. O. Carroll of Wright Field, and distribution of the "E" pins to Rohm & Haas workers by Lt. Comm. O. R. Sutherland of the Philadelphia Navy Yard.

The streamlined Plexiglas noses and turrets which the Rohm & Haas plant turns out in large quantities are said by aviation experts to give U. S. warplanes "an advantage not held by planes made in other countries." And the speed with which they are being produced has repeatedly been commended by Army and Navy officials. Recently Rear Admiral J. H. Towers, former Chief of the Navy Bureau of Aeronautics, wrote company officials that "your actions in making available an adequate supply of Plexiglas, and in voluntarily reducing its cost are evidences of fine co-operation in this time of emergency."

Perfecting of the transparent plastic, which is actually clearer than plate glass, less than half as heavy and virtually shatter-proof, was announced by Rohm & Haas only a few years before the outbreak of the present war, although nearly forty years of research preceded the announcement. Known as an "acrylic resin," Plexiglas can be formed into strong, curved shapes which withstand 400-mile-an-hour air-blasts and flying temperatures ranging from 70° below zero to 140° above.

In the Bristol Plexiglas plant, complicated chemical compounds are used to produce the resin, which is first cast into large flat sheets. Ingenious molding apparatus then converts the flat sheets into bomber noses—through which the bombardier and front gunner sight their targets and enemy planes—and top, belly and rear gun-turrets, which have played such an important part in the high toll of enemy planes rolled up by U. S. gunners. One of the latest achievements of the plant is the production of thousands of observation domes, called "astrodomes," through which the navigator of a bomber can sight the stars and determine the plane's position anywhere on earth within two miles.

Aviators' clothing today is made almost exclusively from sheepskin leather tanned with the wool on. The wool forms the lining of the suit and the flesh side of the skin is turned outward, forming a type of clothing which has been shown to give more protection against cold than any other available material. At Bristol is made the acrylic resin which is used to coat the outside of these suits and make them resistant to gasoline and oil, waterproof, and soft even in extreme cold.

● ADVISORY GROUP FORMED

To increase the value of the "Crown" Tested Plan to the consuming public and to all the various trade factors participating in the plan, the American Viscose Corporation has formed a "Crown" Tested Advisory Group comprising independent textile authorities and members of the company who are actively connected with the carrying out of the "Crown" Tested Plan, it was announced recently.

The membership of the group consists of Margaret Dana, consumer relations counsel; M. Earl Heard, Dean of the Philadelphia Textile Institute; Dr. Pauline Beery Mack, Director of the Ellen H. Richards Institute of the Pennsylvania State College; Dr. Louis A. Olney, Head of the Department of Chemistry and Dyeing of the Lowell Textile Institute; and the following representatives of the American Viscose Corporation: Dr. F. Bonnet, head of the company's Standards Department; Charles W. Rice, Jr., Advertising Manager; Arthur R. Wachter, head of the "Crown" Tested Department; and Alfred C. Werner, Assistant General Sales Manager.

The objectives of the Advisory Group are defined as: (1) to review testing methods, particularly as they relate to rayon fabrics; (2) the correlation of testing methods to consumer performance; and (3) the study of general consumer problems in connection with rayon fabrics.

● JANUARY TEXTILE RESEARCH

In the high school senior group are the future research chemists, physicists, and engineers. Work in an industrial laboratory before entering college permits high school seniors to visualize themselves in the field of research, and allows the research director to watch for special research qualities that deserve encouragement and vocational guidance. A novel plan is in operation at Alexander Smith & Sons Carpet Company, which, if generally adopted by the industry, would add to the number of individuals making research their vocation. This is described in the January issue of *Textile Research*, official publication of Textile Research Institute and Textile Foundation.

Important technical articles of interest to research workers and technicians in the field of textiles, as they appear in scientific, technical, and trade publications, will be abstracted in *Textile Research*. The first issue of this service appears in the January issue.

The preparation through fractionation of commercial cellulose acetate of a series of samples of cellulose acetate, differing widely with respect to molecular chain length, has been previously reported by Research Associates of the Textile Foundation. In this issue the results of studies of the effect of molecular chain length on a number of the mechanical properties of films prepared from these materials is reported.

Another article lists the important characteristics of Bubblfil, compares these qualities with those of buoyant kapok, and describes some of the important uses of this new product of research. This new man made fiber, each fiber consisting of a chain of air-filled cells, is an ideal insulating material for aviators' jackets and for sleeping bags, and it has been approved for use as a buoyant filler in life preservers and in rafts and pontoons.

● SHO-PAL

For pigment printing and pigment dyeing in water solution, Stein, Hall & Co., 285 Madison Ave., New York, has developed Sho-Pal, a dry product which acts as a thickener and binder for printing. In lesser concentrations it is said to form a satisfactory padding liquor for pigment dyeing. It is stated that the fact that Sho-Pal is used with water eliminates the fire hazard and toxicity of solvents, and also avoids the danger of damaging rubber blankets.

Water dispersable pigments of any type may be used with Sho-Pal. Any other types of color can be used in the same patterns, because the paste is made up with water. Homogenizing equipment is unnecessary and no strategic materials are involved. Curing is eliminated. It is claimed that thorough drying is the only requirement to obtain fastness to washing and dry cleaning.

● NOMINATED FOR PRESIDENT

Wallace Patten Cohoe, Consulting Chemist of New York City, has accepted nomination for the Presidency of the Society of Chemical Industry, an international professional organization with headquarters in London, England. The election of officers will take place at a meeting to be held in July 1943 in England. Dr. Cohoe has been a Vice-President of the Society since 1940 and formerly was Chairman of the Canadian Section (1912) and Chairman of the American Section (1938-40) of the Society. Dr. Cohoe was born in Nor-

wich, Ontario, February 22, 1875. He was educated at McMaster University, Toronto and Harvard University. Early in his career he was professor of chemistry at McMaster University. His work in the chemical field has been to a large extent related to cellulose and textiles. In 1913 he designed a process and commercially produced sausage casings from viscose. Basic patents on this process were obtained in countries all over the world. He was the first to show that only the cellulose content of sawdust is hydrolyzed to fermentable sugars.

He is a member of American Chemical Society, American Institute of Chemical Engineers, Fellow American Institute of Chemists, and Fellow American Association for the Advancement of Science.

• COATED FABRIC ADVISORY COMMITTEE

The January allocation for nitrocellulose was discussed by members of the Pyroxylin and Vinyl Resin Coated Paper and Fabric Industry Advisory Committee at a meeting in Washington.

Nitrocellulose was freer in January than in previous months, and present indications are that February allocations will be relatively the same as those of January, members were told. It was pointed out that end uses may change from month to month.

All ethyl cellulose produced is needed by the Army and Navy and there is none available for civilian use, government representatives stated.

A representative of the Quartermaster Corps discussed the use of koroseal, NW vinyl resin, and NS vinyl resin in the manufacture of raincoats. Polyvinyl butyral, formerly used, is being curtailed with the exception of the thermosetting type.

Members were reminded that the supply of castor oil, formerly used in pyroxylin coatings, is short. It is not anticipated that any will be granted in the future for shoe plasticizing, pyroxylin finishes, or coatings for shoes for civilian uses. While it has been allowed for military purposes, it is possible specifications of some military articles will be changed to permit substitution.

It was suggested that members of the industry pool their tank car facilities to relieve as much as possible the tank car shortage. Office of Defense Transportation Order 18 on maximum car loadings was discussed.

• APPOINTED WESTERN MANAGER

The appointment of Kenneth A. Coate, as Western Manager of the Lake Department, Calco Chemical Division, American Cyanamid Company, will meet with much interest in the paint and ink trades.

Mr. Coate's identity with Calco since 1928 has taken him to the Canadian, Philadelphia and Chicago territories, where he has been active in sales work, principally to the lake trade.

Mr. Coate is a graduate of Wilmington College, Wilmington, Ohio, where he has received a degree of Bachelor of Arts upon his graduation in 1923.

• IMPORTANCE OF RESEARCH

The importance of research, both to the present war effort and to our economic development after the war, was given special emphasis at the recent Winter Meeting of the Industrial Research Institute in Philadelphia, January 22 and 23, at the Hotel Warwick. It was attended by over seventy-five industrial executives and research directors, representing member companies, and their guests. The sessions were all informal round-table conferences, as is the custom in Institute meetings.

At the opening session Friday morning, W. C. Stevenson, Chief, Laboratories and Technical Equipment Section, Safety and Technical Equipment Division, War Production Board, described the present regulations of WPB that affect the supply of materials and equipment for research laboratories. He stated that the War Production Board feels that research is one of the most important phases of the war effort. The Laboratories and Technical Equipment Section has been charged with the duty of working out ways in which laboratories doing essential research can obtain materials and equipment with the least possible delay and burdensome paper work. Mr. Stevenson explained how to take advantage of the special concessions that have already been secured for research laboratories under the Production Requirements Plan and the Controlled Materials Plan that is gradually supplanting it.

R. C. Newton, Vice President, Swift & Company, Chicago, lead a discussion Friday evening on post war planning and the research laboratory. It was brought out that, without slackening their all-out war effort, many industrial concerns are today giving some organized study to post war problems and how to meet them. The important part that industrial research directors must play in the post war planning activities of their companies was emphasized.

As a departure from their usual practice of spot lighting the faults of their research organizations in their discussions the members spent a little time in self analysis at this meeting. They were aided by Arthur J. Slade of Rogers & Slade, New York, who outlined what the president of a company wants in his director of research and development and presented a set of specifications he had formulated from suggestions made to him by a number of company presidents. It was brought out in the discussions that most research directors have come up through their companies to their present positions.

A symposium on new research tools and their applications was conducted Friday afternoon in place of the usual visit to a local plant or laboratory. This comprised talks, illustrated by movies and slides, on high speed photography by Prof. Harold E. Edgerton, Massachusetts Institute of Technology, Cambridge, Mass. and F. Nickel, Jr., Western Electric Company, New York, and on the electron microscope by M. C. Banca, Radio Corporation of America, Camden, N. J.

The possibilities and limtations of job evaluation procedures, as applied to research organizations, were discussed at simultaneous group conferences on Saturday morning under the leadership of F. W. Blair, Chemical Director, The Proctor and Gamble Company, Ivorydale, Ohio; J. N. Dow, Technical Director, Bigelow Sanford Carpet Company, Thompsonville, Conn.; J. M. McIlvain, Administrative Supervisor, Research and Development Department, The Atlantic Refining Company, Philadelphia, Pa.; and R. S. Taylor, Chief Engineer, Servel, Inc., Evansville, Ind. Following this A. G. Ashcroft, Product Engineer, Alexander Smith & Sons Carpet Company, Yonkers, N. Y. and chairman of a special IRI committee on the education, selection and training of research personnel presented the results of an inter-laboratory study of scientific aptitude and vocabulary tests for research personnel. A business meeting of the institute concluded the formal program.

The Industrial Research Institute, an affiliate of the National Research Council, undertakes to promote improvement of methods and more economical and effective management in industrial research through the cooperative efforts of its members. The membership is composed of fifty industrial concerns maintaining research laboratories. Their top executives in charge of research represent them in the activities of the Institute. Its headquarters are at 60 East 42nd Street, New York.

• JOINS SONNEBORN

Rudolph R. Cubicciotti is now associated with L. Sonneborn Sons, Inc., 88 Lexington Avenue, New York City, refiners of petroleum products and manufacturers of paints and waterproofings.

Immediately after his graduation from the University of California as Chemical Engineer, Mr. Cubicciotti joined the Union Oil Company of California and served with that organization for seventeen years. During that period he was actively engaged in Union's refining, research and sales divisions.

It is expected that his diversified experience and thorough grounding are considerable assets in his present capacity as executive assistant to Julius F. Roten, Vice-Presdient of L. Sonneborn Sons, Inc.

Quantitative Analysis—

(Concluded from Page 76)

ple and the reference cotton are run simultaneously at the one temperature.

TABLE II

Type Fabric	Hand Separation % Rayon	Hand Separation % Cotton	$Ba(OH)_2$ Method % Rayon	$Ba(OH)_2$ Method % Cotton
Rayon Cotton				
Knit back fleece	49.5	50.5	47.7	52.3
Rayon cotton bengaline.....	52.7	47.3	50.0	50.0
Rayon-cotton novelty weave	45.0	55.0	41.3	58.7
Rayon-cotton hopsacking ..	55.5	44.5	52.4	47.6
Rayon-cotton print cloth ..	40.7	59.3	40.1	59.9
Spun rayon-cotton shantung	55.5	44.5	(*54.3 (53.6	(*45.7 (.46.4

* Treated admixed with wool with 5% KOH for 10 minutes to remove the wool, washed thoroughly and analyzed by the barium hydroxide method.

V. CONCLUSION

A study has been made of the Hydroxide Adsorption Numbers (corrected Barium Activity Numbers) of various viscose rayons, both yarn and fabric. These values vary over a limited range, without apparent relation to manufacturer, fabric construction, yarn size, or dulling agents present. The lowest values are those given by pigmented yarns. It has been found possible to assign a Hydroxide Adsorption Number of 348 to viscose rayon. This figure is the average Hydroxide Adsorption Number of a large number of rayons investigated. The average per cent deviation in these determinations was found to be 3.7 per cent. The average Hydroxide Adsorption Number of viscose rayon represents a more than three-fold greater adsorption than that shown by unmercerized cotton which has a constant Hydroxide Adsorption Number of 100. This finding is the basis for a new quantitative analysis of viscose rayon-cotton mixtures. In this new procedure, the Hydroxide Adsorption Number of the unknown viscose rayon-cotton mixture is determined. An improved quantitative method and a suitable formula for calculation have been developed for this. The percentage of rayon and of cotton is then obtained from the constant Hydroxide Adsorption Number of 348 assigned to viscose rayon and that of 100 for unmercerized cotton.

Analysis of various "known" mixtures by this method indicate good results, within the accuracy desired for mill and testing laboratory. The greatest deviation from the true values was found with mixtures containing a large percentage of rayon. This is attributed to the fact that the Hydroxide Adsorption Number for rayon is only approximate, whereas for cotton, exact. Some difficulty was encountered with one fabric containing pigmented rayon. The removal of wool or silk from wool, silk, viscose rayon and cotton mixtures by hot 5 per cent caustic has no effect on the Hydroxide Adsorption Numbers of the rayon-cotton residue.

The procedure with the constants as given is applicable only to fabrics or yarns containing unmercerized cotton. Mercerized cotton has a Hydroxide Adsorption Number from 100-165, depending upon the degree of mercerization. Linen has a Hydroxide Adsorption value of 100, and thus linen-viscose rayon mixtures may be analyzed by the same method, using the same values as for cotton-viscose rayon yarn. Cuprammonium rayon yields slightly lower Hydroxide Adsorption Numbers than viscose rayon and work is being continued to determine the constant for this type of rayon.

The Hydroxide Adsorption Number method for rayon-cotton analysis is advocated over existing methods because of (1) its simplicity, requiring little attention and apparatus, and (2) its applicability to routine work where a large number of simultaneous analyses must be conducted.

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POSITION WANTED: Cotton and rayon yarn dyer with 20 years experience. Familiar with various types of skein dyeing machinery and an expert on package dyeing. Good knowledge of fast colors. Past record will show capabilities in handling large production. Write Box No. 420.

WANTED: Laboratory textile printer. Young man with good laboratory experience, preferably one who has been employed in a mill. Knowledge of Napthol and Vat application required. Needed in standardization department of a substantial dyestuff manufacturer. Write Box No. 421.

WANTED: Graduate chemist—dyer for rayon dyehouse with good all-round experience in dyeing and finishing silk, rayon and acetate piece goods. Must possess executive ability. Write Box No. 422.

WANTED: Dyer familiar with dyeing rayon and acetate fabrics on jigs. Give full details of experience. Write Box No. 423.

WANTED: Hosiery Dyer and Finisher. Familiar with all types of fabrics. Must be able to supervise Boarding, Inspecting, Packing, etc. Also take charge of all maintenance in plant. State education, experience, draft status and salary expected. Write Box No. 424.

WANTED: Textile chemist-analyst, male or female. Routine chemical and dyestuff testing. Good opportunity for right person. State education, experience, draft status, and salary expected. Write Box No. 425.

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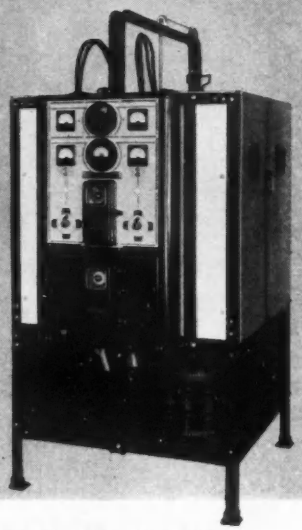

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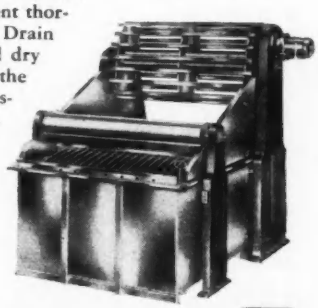

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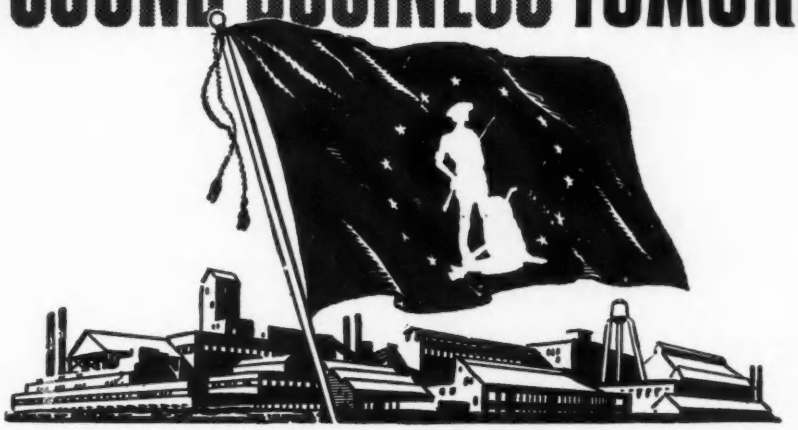

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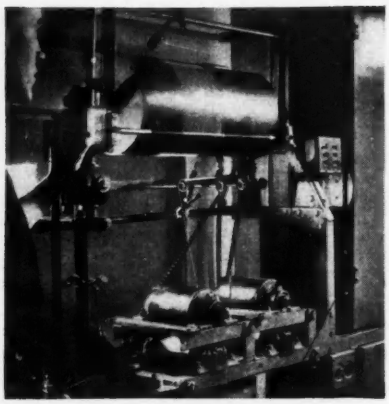
Textile chemicals

ARE ONLY ONE GROUP OF MANY PRODUCTS OF ROHM & HAAS RESEARCH THAT WORK FOR INDUSTRY IN PEACE AND WAR

AMONG textile mills, Rohm & Haas Company is best known for its development of TRITONS, RHOTEXES, DEGOMMAS, RHOPLEXES, RHONITES, PROTOLIN, FORMOPON and LYKOPON.

This Company through research has expanded into many other fields of industry. This page shows a few typical examples.



MODERN FAST TEXTILE COLORS presented a need for reducing agents. Rohm & Haas LYKOPON was the first to fill this need. Among our many other developments are RHONITE finishes that make fabrics "crushproof". This yarn slasher is typical of equipment in our textile laboratories which permits close approximation of mill results.

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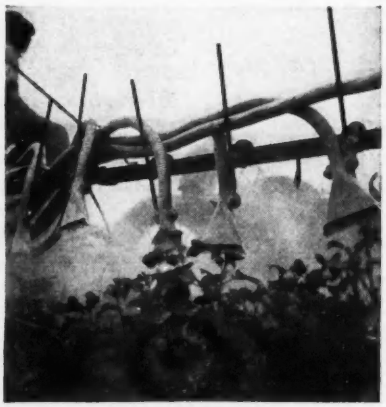
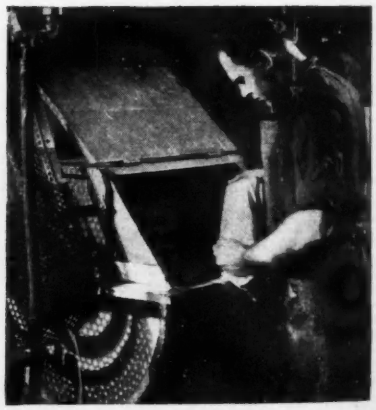


LETHANE 60 WAS DEVELOPED for use in agricultural dusts and sprays. Wide commercial use of this synthetic insecticide has demonstrated that replacing 50% of the rotenone or pyrethrum in dusts and sprays with LETHANE 60 not only stretches this country's limited supplies of botanical toxicants, but actually makes better products.



THE ROHM & HAAS COMPANY developed the first synthetic bate for leather. Today, this bate, under the name OROPON, is in common use in every country of the world. Later developments include synthetic tanning materials to produce great amounts of high quality white leather and finishes producing flexible and washable leathers.

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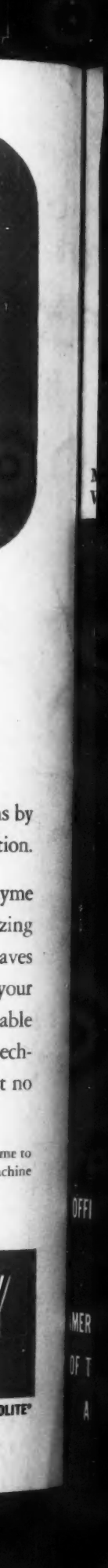
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